



BART Bicycle Plan Modeling Access to Transit

July 2012

Funded with a grant from the Caltrans Statewide Transit Planning Studies program



Eisen | Letunic
in association with Fehr & Peers and Nelson\Nygaard



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Table of Contents

Acknowledgments	iii
Executive summary	v

Chapters

1. Introduction	1
2. Existing conditions	5
3. Goal and strategies	27
4. Modeling future investment	37
5. Recommendations	43

Appendices

A. Online survey and responses	55
B. Bike station survey and responses	67
C. Summary of focused group discussions	73
D. Summary of advocate and BPAC meetings	79
E. History of station improvements	89
F. 2011 bicycle theft data	93
G. Needed station area improvements	95
H. Investment tool user's guide	107
I. Investment tool development history	121
J. Potential funding sources	139
K. Public comment summary	141

Tables

1. Highlights from the 2011 online survey	7
2. Home-to-BART bicycle access mode share	11
3. Bicycle parking offered at BART stations	12
4. BART bicycle parking inventory	14
5. BART bicycle parking occupancy	16
6. BART bicycle access improvements by station ...	18
7. Station bicycle mode share by level of infrastructure investment	20
8. Bicycles parked versus bicycles brought onboard trains, by station	22
9. BART stations that charge for auto parking	26
10. Access mode from home to BART	27
11. BART station typologies	38
12. Inputs to Bicycle Investment Tool	40
13. Outputs from Bicycle Investment Tool	40

Figures

1. BART station typologies	6
2. Bicycle Investment Tool—Inputs for bicycle parking	40
3. Bicycle Investment Tool—Sample outputs	41



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Executive Summary

Plan Goal

Like similar transit systems in Japan and Western Europe, BART can retool its stations and approach to access planning to attract more bicycles and fewer cars to the system each day. Bicycling to BART, particularly when those trips replace automobile access, helps avoid construction of costly auto parking spaces, can increase ridership, reinforce the agency's image as a green transportation provider, promote fitness and public health, and contribute to achieving regional goals to reduce traffic congestion and greenhouse gas emissions. Providing plentiful and convenient bike parking is also the most effective tool BART has to encourage as many passengers as possible to leave their bicycles at the station, rather than bringing them onboard, thus leaving space for the system to carry more passengers.

The goal of this plan is to double BART bicycle access, to 8% of all trips, by 2022.

When this plan was published in 2012, approximately 4% of home-based trips, or about 14,000, were made to and from BART stations each weekday by bicycle. Building on the success of past BART bicycle access improvements, the growth in popularity of bicycle travel throughout the BART service area, and the significant improvements to bike travel recommended in this plan, this BART Bicycle Plan's goal is to double this rate, to 8%, by 2022. Because systemwide ridership is expected to increase by about 28% by then, including to new extension stations, achieving this goal will bring 35,000 bicycle trips to BART stations each weekday, thus transforming BART from a system that allows bikes to one that depends on them.

Plan Purpose

The purpose of this plan is two-fold:

- To outline the specific strategies needed to encourage ever greater numbers of passengers to bike to and park at BART stations.
- To create a Bicycle Investment Tool that BART staff and other transit agencies can use to select the

improvements that will result in the largest increases in bicycle access trips.

Following completion of this plan, BART access planning staff will prioritize and carry out the recommended strategies by identifying annual implementation objectives, developed in concert with staff from BART Police, Transportation Planning, Marketing and Research, and Operations departments. This bicycle-specific work plan will be based on opportunities presented by upcoming capital projects already planned at stations, pursuing projects eligible for available funds, and consulting the Bicycle Investment Tool.

Recommended Strategies

The BART Bicycle Plan has but a single goal—to double the share of BART passengers systemwide who access stations by bicycle by 2022. This plan presents a number of strategies to accomplish this, organized into the following five objectives:

- 1 **Cyclist Circulation**
Improve station circulation for passengers with bicycles
- 2 **Plentiful Parking**
Create world-class bicycle parking facilities
- 3 **Beyond BART Boundaries**
Help assure great bicycle access beyond BART's boundaries
- 4 **Bikes on BART**
Optimize bicycle accommodations aboard trains
- 5 **Persuasive Programs**
Complement bicycle-supportive policies and facilities with support programs

These categories include strategies that range from ideas that pertain to individual stations to those that would be applied systemwide, from approaches to expand bicycle parking options to those that improve onboard access. While the Goal & Strategies chapter suggests many ways BART could encourage more

passengers to bike to its stations, the plan's last chapter focuses on the 20 expected to be the most effective, and on which BART is recommended to concentrate its resources during the ten-year plan period. The plan concludes with a list of next steps for BART staff to follow in order to implement the recommended strategies and achieve the plan goal of doubling bicycle access to BART.

Recommended strategies

① Cyclist Circulation

- 1.1 Develop and install wayfinding signage
- 1.2 Optimize routes between surrounding network and fare gates
- 1.3 Evaluate and install stairway channels
- 1.4 Revisit bicycles on escalators policy
- 1.5 Clean elevators regularly

② Plentiful Parking

- 2.1 Provide adequate bicycle parking of each type
- 2.2 Fight bicycle theft
- 2.3 Maintain bicycle facilities more frequently
- 2.4 Expand bicycle parking payment options

③ Beyond BART Boundaries

- 3.1 Evaluate and implement bicycle sharing at BART stations
- 3.2 Support local efforts to improve bicycle access to stations
- 3.3 Create station area maps with recommended bike routes

④ Bikes on BART

- 4.1 Provide space for bicycles in new BART cars
- 4.2 Evaluate blackout periods

⑤ Persuasive Programs

- 5.1 Educate passengers and staff on use and benefits of bicycles
- 5.2 Improve communications with customers on BART bicycle policies and facilities
- 5.3 Create bicycle program in BART Capital Improvement Plan
- 5.4 Collect access mode data before/after bicycle improvements
- 5.5 Increase automobile parking fees
- 5.6 Participate in more Bike-to-Work day events

Bicycle Investment Tool

To help BART and other commuter rail operators predict the effect of an assortment of bicycle-related investments on bicycle access, and to compare these investments to the cost of providing automobile parking, this plan also includes a new Bicycle Investment Tool. The tool, which employs a simple spreadsheet interface, will help BART achieve the plan goal and implement its strategies by helping identify the investments that will encourage the most passengers to bicycle to each station, including new passengers and existing riders who shift from other modes.



Plan Development Process

The BART Bicycle Plan was developed by a team of consultants guided by BART staff in 2011 and 2012. A large External Technical Advisory Committee (TAC)—comprising bicycle planning staff from countywide agencies, local governments, representatives of countywide bicycle advocacy groups and Caltrans staff—and an Internal TAC, made up of representatives of BART Customer Access, Planning, Marketing and Research, Transportation and Operations, helped inform the process and reviewed early drafts of each plan chapter and investment tool iteration (see Acknowledgements). The BART Board of Directors reviewed the plan in June 2012.

1 | Introduction

Plan Purpose

Like similar transit systems in Japan and Western Europe, BART can retool its stations and approach to access planning to attract thousands more bikes than cars to the system each day. Bicycling to BART, particularly when those trips replace automobile access, helps BART and the greater Bay Area in countless ways. For the transit agency, bicycle parking and other related improvements are less costly to build than auto parking; can increase ridership by passengers who, once in their cars, would drive to their destination rather than face the uncertainty of finding a BART parking space; promote fitness and public health; support related BART policies; and reinforce the agency's image as a green transportation alternative. Beyond the BART system, increasing the number of passengers who reach stations by bicycle also helps achieve regional transportation, land use, public health and climate change goals, while improving the health of passengers who bike.

The purpose of this plan is to help BART transform itself from a system that allows bikes to one that depends on them.

When this plan was published, approximately 4% or about 14,000 home-based passengers reached BART stations each weekday by bicycle. Thanks to the success of past BART bicycle access improvements, the growth in popularity of bicycle travel throughout the BART service area, and the significant improvements to bike travel recommended in this plan, this BART Bicycle Plan's goal is to double this rate, to 8% by 2022.

The purpose of this plan is twofold:

- To outline the specific strategies needed to persuade ever greater numbers of passengers to bike to and park at BART stations.
- To create a Bicycle Investment Tool that BART staff and other transit agencies can use to select the improvements that will result in the largest increases in bicycle access trips.

Following completion of this plan, BART access planning staff will prioritize and carry out the recommended strategies by identifying annual implementation objectives, developed in concert with staff from BART Police, Transportation Planning, Marketing and Research, and Operations departments. This bicycle-specific work plan will be based on opportunities presented by upcoming capital projects already planned at stations, pursuing projects eligible for available funds, and consulting the Bicycle Investment Tool.

Plan Organization

There are five chapters and nine appendices in the BART Bicycle Plan. This section contains a brief description of each.

1. Introduction chapter

This chapter provides an overview of the purpose, organization and process of developing the plan and the role of the companion Bicycle Investment Tool.

2. Existing Conditions chapter

Understanding current conditions for passengers who choose to bicycle to BART is an essential first step in planning how to improve those conditions, thereby increasing future bike access to the system. The Existing Conditions chapter presents data on historic bicycle access trends, bicycle parking facilities and use at each station, and the findings of other quantitative and qualitative research carried out for this plan. This information was used to develop the Bicycle Investment Tool, as well as the plan's goals and recommended strategies. Although much of this data is constantly changing, it provides a basis for selecting the strategies that will best achieve this plan's ambitious goal.

3. Goal & Strategies chapter

The BART Bicycle Plan has but a single goal—to double the share of BART passengers systemwide who access stations by bicycle by 2022. In the Goal & Strategies chapter, potential strategies to achieve this goal are organized into the following five objectives:

- ① Cyclist Circulation
- ② Plentiful Parking
- ③ Beyond BART Boundaries
- ④ Bikes on BART
- ⑤ Persuasive Programs

Each of these categories includes strategies that range from ideas that pertain to individual stations to those that would be applied systemwide, from approaches to expand bicycle parking options to those that improve onboard access.



4. Modeling Future Investment chapter

This plan includes a new Bicycle Investment Tool, created to help BART and other commuter rail operators predict the effect of an assortment of bicycle-related investments on bicycle access, and to compare these investments to the cost of providing automobile parking. This chapter explains the tool purpose and uses, needed inputs and output, and how BART staff will use the tool in concert with other mechanisms that influence the agency's investment decisions.

The BART Bicycle Plan includes a new Bicycle Investment Tool, created to help BART and other commuter rail operators predict the effect of an assortment of bicycle-related investments on bicycle access.

5. Recommendations chapter

Of the myriad ways BART can encourage more passengers to bicycle to its stations suggested in the Goal & Strategies chapter, the plan's last chapter focuses on the 20 expected to be the most effective.

The plan recommends that BART concentrate its resources on these recommended strategies during the ten-year plan period. This chapter concludes with a list of next steps with which BART staff can implement the recommended strategies and achieve the plan goal of doubling bicycle access to BART.

Appendix A: Online Survey & Responses

Appendix A provides a questionnaire distributed in 2011 to the general population of BART passengers, as well as to a much larger sample of self-described bicyclists, and the survey results.

Appendix B: Bike Station Survey & Responses

BART passengers who use the system's two attended bike stations were asked to complete a survey in 2011. The survey instrument and results are reproduced in this appendix.

Appendix C: Summary of Focused Group Discussions

Four focused group discussions were held in May 2011 with BART passengers, most of whom currently reach stations by means other than the bicycle, but who routinely bike for other trips. Appendix C provides a summary of the challenges and solutions to encouraging passengers to access BART by bike suggested by participants, as well as responses to questions posed to meeting participants.

Appendix D: Summary of Countywide Advocate & BPAC Meetings

Meetings with representatives of the East Bay Bicycle Coalition (representing cyclists in Alameda and Contra Costa counties) and the San Francisco Bicycle Coalition were held in 2011 to discuss needed station and station area improvements. Members of Bike San Mateo, a virtual organization, submitted input online and were represented on the plan's External Technical Advisory Committee. Meetings were also held with the countywide bicycle and pedestrian advisory committees in Alameda, Contra Costa, San Francisco and San Mateo counties in 2011. This appendix contains a summary of the suggestions communicated in these meetings.

Appendix E: History of Station Improvements

Augmenting data presented in Existing Conditions chapter Table 6, this appendix compares station-

specific bicycle parking and other access improvements BART made between 1998 and 2008 to changes in bicycle access to those stations during the same period.

Appendix F: Bicycle Theft Data

Appendix F catalogs bicycle thefts reported to BART police in 2011, by month and by BART station.

Appendix G: Needed Station Area Improvements

This appendix lists what are considered by local bicycle planners to be the most needed improvements to safe and convenient bicycle access off of BART property at each of BART's 44 stations. During the five years before this plan was published, the Metropolitan Transportation Commission (MTC) and Caltrans have provided considerable funding to various cities for station area planning, including an analysis of multi-modal station access. Many of these locations are near BART stations, including San Leandro, South Hayward, Union City, Balboa Park, Daly City, North Concord, 19th Street, Lake Merritt, Fruitvale, MacArthur, Walnut Creek and Dublin/Pleasanton stations.

Appendix H: Investment Tool User's Guide

Appendix H supplements the Bicycle Investment Tool chapter and link to the spreadsheet tool itself by providing specific guidance to tool-users.

Appendix I: Investment Tool Development History

The history of the development of the Bicycle Investment Tool is provided in this appendix, as well as suggestions for future improvements to the tool.

Appendix J: Potential Funding Sources

Appendix J provides a summary of funding sources that could be used for the wide range of recommended investments expected to be available over the life of the plan.

Appendix K: Public Comment Summary

Comments on the April 2012 draft of this plan submitted by the public, advocacy groups and the BART Board are summarized in Appendix K.

Plan Development Process

A successful 2009 grant proposal to the Caltrans Statewide Transit Planning Studies program defined the parameters of this plan (and helps explain the less traditional structure and contents). The plan helps implement the Transit-Oriented Development (TOD) policy adopted by the BART Board in 2005, "Reduce the access mode share of the automobile by enhancing multi-modal access to and from BART stations in partnership with communities and access providers." This plan also supports BART goals, strategies and targets laid out in the 2008 Strategic Plan regarding access, transit-oriented development and sustainability. It was developed by a team of consultants guided by BART staff between spring 2011 and spring 2012. A large External Technical Advisory Committee (TAC) and a smaller Internal TAC reviewed each chapter and investment tool iteration. The External TAC comprised bicycle planning staff from countywide agencies, local governments, representatives of countywide bicycle advocacy groups and Caltrans staff (see Acknowledgements). BART Customer Access, Planning, Marketing and Research, Transportation and Operations staff made up the Internal TAC. The BART Board of Directors reviewed the plan in June 2012.



2 | Existing Conditions

Introduction

This chapter paints a picture of the current conditions for accessing BART by bicycle and provides the understanding necessary to transform BART from a transit system that allows bikes to one that depends on them. It focuses on how many people are accessing BART by bicycle, at what stations, and why they choose to do so (or not).

Between 1998 and 2008, BART's bicycle access rate increased by 69%, while daily ridership increased by just 27% during the same period.

The research presented in this chapter includes bicycle access trends between 1998 and 2008, comparisons of bike facilities between stations, and qualitative input from passengers and focus groups, all of which informed the investment tool, strategies and recommendations in the remainder of the plan. Specific data include access mode split, bicycle parking supply and utilization, onboard bicycle access rates, and factors that influence BART passengers' decision to access BART by bicycle. These factors fall into seven categories: bicycle parking, onboard bicycle access, transporting bicycles through stations, communication, auto parking charges, first and last mile, and other factors.

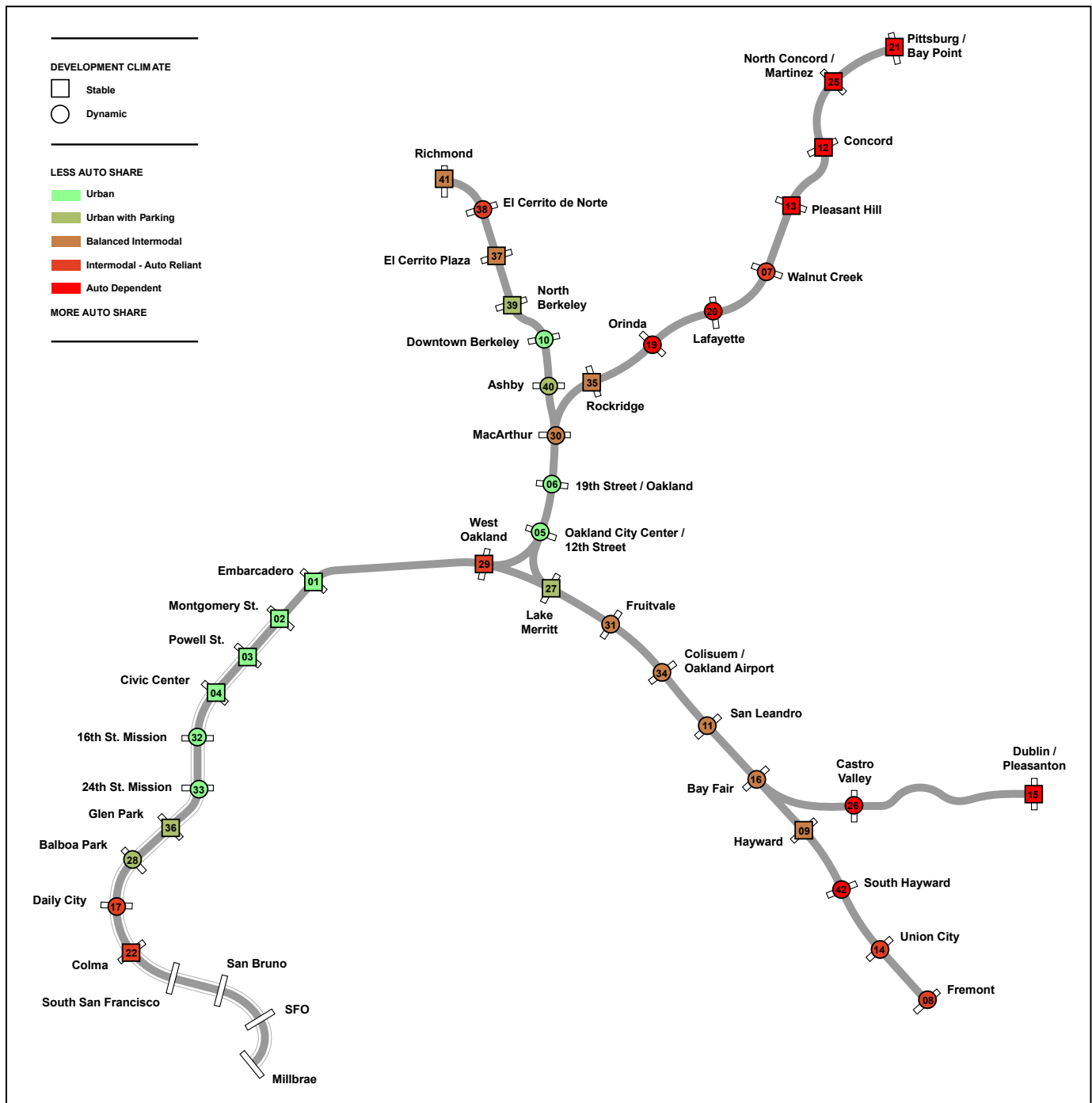
Although each station is unique, in order to facilitate the analysis of access mode, BART has grouped the stations into five categories or typologies, based on land use surrounding the station, the presence or absence of automobile parking, degree of auto dependency and availability of multiple modes (see Figure 1). These typologies are discussed in more detail in Chapter 4 in the context of the investment model.

Key findings of Existing Conditions chapter

1. The original 2002 BART Bicycle Plan established a goal of 3% bicycle access by 2010 (from 2.5% in 2002). By that year, the goal was exceeded with 4.1% of passengers biking to BART.
2. Between 1998 and 2008, the bicycle access rate increased by 69%, while daily ridership increased by just 27% during the same period.
3. There is a high correlation between investment in secure bicycle parking and increased bicycle access mode share.
4. Although there is not necessarily direct evidence that parking charges lead to greater bicycle use, those stations that began charging for auto parking between 1998 and 2008 for the most part had the largest increases in bicycle access during that period. Furthermore, stations with large quantities of free parking tended to have the lowest rates of non-car access.
5. Among bicycle racks located outside of station fare gates, those that are closer to the fare gates are utilized far more than those that are farther away.
6. A majority of weekday passengers who bike to BART do not park their bicycles at the station, but rather bring them onboard a train.
7. Over 20% of surveyed attended bike station¹ users said they would bring their bike onboard the train if they didn't have access to the safe and secure bike parking that bike stations provide.
8. Focus group participants—BART passengers who bike at least weekly, but not to access BART—stated that because the blackout period limits the possibility of commuters bringing a bike on BART, passengers with bicycles are required to plan ahead to a much greater extent than other passengers.

¹ BART uses the term bike station to describe both attended and self-serve group parking facilities. The attended facilities provide related services such as bicycle repair, rental and retail sales.

Figure 1: BART station typologies



Source: Access BART, 2006

Data Sources

Background data for the Existing Conditions chapter came from quantitative surveys—either performed specifically for the plan update or for previously published BART research—and qualitative methods.

Quantitative research

1998 and 2008 Station Profile Studies

These comprehensive surveys provide a snapshot of weekday BART customers at each BART station and for the overall system. The most recent station profile information, from 2008, was drawn from 50,000 surveys completed by a time-stratified sample of weekday riders, which randomly selects passengers in four separate time periods to survey. The Station Profile Study, which highlights passengers' demographics and station access patterns, has been an important source of BART ridership data over the years; the first was launched in 1973 and the 2008 version is the 13th such study in BART's 39-year operating history. The data from these studies allows comparison between 1998 and 2008 bicycle access mode share, as well as being the most recent comprehensive source of station-specific access mode share data. The full 2008 study is available at www.bart.gov/about/reports/profile.aspx.

BART Customer Satisfaction Surveys

BART customers are surveyed every two years to determine how well BART is meeting customers'

needs and expectations. The latest study was performed in 2010 and was completed by over 5,800 passengers, who rated 47 service attributes, ranging from on-time performance to station cleanliness. Although not as comprehensive with respect to bicycle-related information, the survey offers the most recent estimate of the number of BART passengers who access stations by bicycle. See www.bart.gov/docs/CustSatReport_2010.pdf for the 2010 survey.

2011 BART Passenger Online Survey

Conducted specifically for the development of the BART Bicycle Plan, this survey sought input on bicycling to BART from all passengers, including those who currently bike to BART and those who reach BART by other means. BART solicited input from "typical passengers" (i.e., the general population of riders, some of whom bike to stations, but most of whom do not) via an email solicitation to the agency's passenger email list and a banner on bart.gov. The "cyclist-heavy sample" was recruited via the countywide bicycle coalitions in BART's service area.

An online survey was conducted specifically for the development of this plan, which sought input on bicycling to BART from all passengers, including those who currently bike to BART and those who reach BART by other means.

Table 1: Highlights from the 2011 online survey

	Typical Passenger Sample	Cyclist-Heavy Sample
Who?	Sent to database of BART riders; Representative of general riding public	Advertised on bart.gov and distributed by bicycle advocacy groups
# respondents	488	3,886
% bike access	6%	56%
Home-to-station distance	70% three miles or less	80% three miles or less
Why do you bike to BART?	#1: Healthy/for exercise #2: Good for the environment	#1: Most convenient travel option #2: Healthy/for exercise
How possible to bike to BART?	33%: "very possible"	47%: "very possible"

Although all respondents completed the same survey, the findings of the 488 passengers who responded to

the general invitation were analyzed separately from those of the 3,886 who accessed the survey via a bike

coalition link. All respondents were asked to rank how they feel about current bicycle access routes to stations, the location and amount of bicycle parking at stations, and the ease/difficulty of bringing bikes through stations and onboard trains. Respondents were also asked to rank the degree to which certain barriers deter them from riding, such as fear of theft from insufficient secure bike parking or the lack of safe bike lanes on city streets leading to stations, and to rank possible solutions to overcome such barriers, such as more bicycle parking or the ability to bring bikes on train cars at all times. This data is one of the foundations of the bicycle investment spreadsheet model developed in conjunction with this plan (see chapter 4). See Table 1 for survey highlights and Appendix A for complete survey responses.

2011 Bike Station Survey

BART passengers who currently use the two staffed BART bike stations—at the Fruitvale and Downtown Berkeley stations—were also surveyed in 2011.² The survey asked respondents why and how often they use the bike station, whether they would still bicycle to BART without a bike station, and whether they use BART after parking their bike or have a local destination (the Berkeley bike station is located outside of the Downtown Berkeley station). The findings of this survey also informed the investment model. For details about this survey, refer to Appendix B.

2011 Bicycle Parking Inventory

Bicycle parking at all 42 BART stations that provide parking was inventoried for supply and occupancy in spring 2011. For each station, parking and occupancy were catalogued by type and location in relation to the fare gates. Although this inventory offers a “snapshot” of parking occupancy at one point in time, the data from this effort is very useful for the investment model as it shows what type of bicycle parking passengers prefer when given a choice.

² The Embarcadero bike station shifted from staffed to automated in October 2009, so users of this facility were not surveyed.

Qualitative data

The following meetings and workshops took place in 2011:

Focused Group Meetings

Four focused discussions with on average 10 invited attendees each were held with BART passengers residing in south Alameda County, San Francisco/San Mateo Counties, north Alameda/west Contra Costa counties, and central/eastern Contra Costa County. Workshop participants who met particular criteria were selected from BART's passenger database. These criteria include riding BART regularly, currently driving to the station, and using a bicycle at least weekly (although not necessarily to reach BART). At each focus group, participants discussed the reasons why they do not bike to BART and possible solutions to overcome their stated barriers. The focus groups also included a few people who currently do ride their bicycles to access BART stations, who offered recommendations on how to improve bike access to and on the system. See Appendix C for a summary of these discussions.

Four focused discussions with on average 10 invited attendees each were held with BART passengers who ride BART regularly, currently drive to the station, and use a bicycle at least weekly (although not necessarily to reach BART).

Advocate meetings

With the aid of aerial maps of each station area, face-to-face and virtual discussions with representatives of the three bicycle advocate groups in the four BART-served counties (East Bay Bicycle Coalition for Alameda and Contra Costa counties, San Francisco Bicycle Coalition, and Bike San Mateo County) were held to reveal station-specific barriers and suggested solutions. Advocates offered their recommendations for improving bicycle parking and access improvements by referencing what currently works well in the BART bike system and other best practices BART could adopt (see Appendix D).

Bicycle/Pedestrian Advisory Committee meetings

Project representatives attended the Countywide Bicycle and/or Bicycle/Pedestrian Advisory Committee meetings in Alameda, Contra Costa, San Francisco and San Mateo counties. The agendas of these meetings included presentations of project goals and timeline; opportunities for public input and review of the draft document; and review of the station aerials, as occurred during the advocate meetings. Write-ups of these meetings are also found in Appendix D.

Two technical advisory committees (TACs) helped inform the plan development process and reviewed early drafts of most plan chapters and the investment tool.

TAC meetings

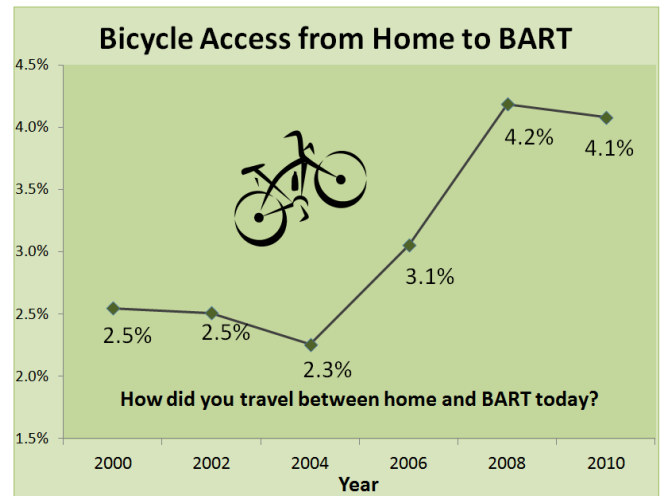
Two technical advisory committees (TACs) helped inform the plan development process and reviewed early drafts of most plan chapters and the investment tool. The External TAC comprised bicycle planning staff from countywide agencies, local governments, representatives of countywide bicycle advocacy groups and Caltrans staff. The Internal TAC was made up of representatives of BART Customer Access, Planning, Marketing and Research, Transportation and Operations departments (see Acknowledgements). Both committees met four times, as follows, to review:

1. The project scope
2. The Existing Conditions and Modeling Future Investment chapters and draft Bicycle Investment Tool
3. The Goal & Strategies and Recommendations chapters, and the revised Bicycle Investment Tool
4. The draft plan

Bicycle access mode share by station

BART's stated goal in its 2002 Bicycle Access and Parking Plan was to increase the percentage of passengers who access BART stations by bicycle from 2.5% in 2002 to 3.0% by 2010, an increase of 20%. With a system-wide bicycle access rate of 4.1% in 2010 (a

60% increase over 2002 levels), BART has greatly surpassed this goal.³



Data from BART's most detailed Station Profile Studies shows an increase of about 6,000 daily bicycle station access trips in the decade between 1998 and 2008: about 8,600 access trips to/from BART were made via bicycle on an average weekday in 1998, while that number increased to about 14,500 in 2008. This is equivalent to a 69% increase over the 10-year period, compared to a 27% increase in total daily ridership over the same period. The increased bicycle access rate is a systemwide average and varies greatly by station. Table 2 shows the bicycle access mode share for home origin trips for 42 BART stations for the years 1998 and 2008, the absolute change in bike access (i.e., 2008 rate minus 1998 rate, comparable to the figures used to calculate progress toward BART's access mode goal) and the percent change between those years (i.e., the rate difference between 1998 and 2008 divided by the 1998 rate, useful for evaluating the access mode change at a particular station relative to itself).⁴ Appendix E compares station-specific bicycle parking additions and other access improvements BART made between 1998 and 2008 to changes in bicycle access to those stations during the same period.

³ 2010 BART Customer Satisfaction Survey

⁴ 1998 and 2008 Station Profile Studies. Two stations were not included: SFO has no bicycle parking or access; West Dublin/Pleasanton opened in 2011, after both surveys were conducted.

The stations at which bicycle mode share increased between 1998 and 2008 include all types of BART stations—from the suburban to the urban, and from transfer stations to stations served by just one line. During this period, the station with the largest absolute increase in access via bicycle was Fruitvale (+5.6 percentage points). The top six stations with increases are all in Berkeley and Oakland, mirroring city-wide mode shifts towards non-motorized transportation in these cities. Indeed, Berkeley and Oakland exhibit some of the highest bicycle commute rates in California, at 6.5% and 2.1%, respectively.⁵ Both cities have adopted aggressive bicycle master plans; citywide investment in both capital and programmatic interventions to encourage non-motorized transportation likely contributed to these dramatic increases in station access via bicycle.

The top six stations with increases are all in Berkeley and Oakland, mirroring city-wide mode shifts towards non-motorized transportation in these cities.

Additionally, while Fruitvale experienced the largest percentage point increase in bicycle mode share from home, the station with the highest percent change was West Oakland, where bicycle access increased 433% (from 0.9% to 4.8%). The City of Oakland's 2007 Bicycle Master Plan supports these observations: the bike mode share for census tracts near BART stations is generally higher than that of other Oakland neighborhoods.⁶ Other stations with large relative increases between 1998 and 2008 include El Cerrito Del Norte, 24th St. Mission, and Balboa Park, at 263%, 243%, and 171%, respectively

The stations that experienced a decrease in access via bicycle between 1998 and 2008 range from stations in San Francisco's retail and financial centers (Powell and Montgomery), to end of the line stations in suburban East Bay locations (Dublin/Pleasanton and Pittsburg/Bay Point). From 1998 to 2008 the Coliseum

saw the largest absolute decrease in bicycle mode share (-2.0 percentage points).

Factors influencing bicycle access

The remainder of this chapter discusses the following factors that influence or are otherwise related to bicycle access to BART stations:

- Bicycle parking
- Onboard bicycle access
- Transporting bicycles through stations
- Communication
- Automobile parking
- First and Last Mile
- Other factors

Bicycle parking

The BART system currently has a total of 4,574 bicycle parking spaces at 42 of its stations (neither the Montgomery nor the San Francisco International Airport stations have bicycle parking), including bicycle racks (inside and outside the fare gates), bicycle lockers (keyed and electronic), and bike stations (attended and self-service) (see Table 4). The Association of Pedestrian and Bicycle Professionals (APBP) divides bicycle parking into short-term and long-term categories in terms of their degree of security and weather protection. Although these groupings don't necessarily apply perfectly to BART, where passengers typically leave their bicycles for many hours, since some prefer the convenience of racks outside the fare gates, while others would rather leave their bikes inside the station, the system provides what can be considered a continuum of parking options that differ in terms of level of security, convenience and cost.

Although the best places for bike racks at a given station must be identified on a station-specific basis, typical considerations include whether or not they're in view of the station agent booth, are in an area with frequent pedestrian traffic, have good lighting and are protected from the weather.

⁵ American Community Survey 5 Year Estimates (2005-2009)

⁶ Oakland Bicycle Master Plan, 2007.

Table 2: Home-to-BART bicycle access mode share (1998 and 2008)

Station	1998	2008	Absolute change	Percent change
12th Street/Oakland	1%	3%	2%	136%
16th Street Mission	3%	5%	2%	59%
19th Street/Oakland	3%	6%	4%	148%
24th Street Mission	1%	5%	3%	243%
Ashby	7%	12%	4%	58%
Balboa Park	1%	2%	1%	171%
Bay Fair	2%	2%	0%	16%
Castro Valley	1%	2%	1%	90%
Civic Center	5%	5%	0%	0%
Coliseum	2%	1%	-2%	-77%
Colma	0%	1%	1%	NA
Concord	2%	3%	2%	100%
Daly City	0%	1%	1%	NA
Downtown Berkeley	6%	10%	4%	69%
Dublin/ Pleasanton	2%	1%	-1%	-26%
El Cerrito del Norte	1%	3%	2%	263%
El Cerrito Plaza	4%	6%	3%	78%
Embarcadero	8%	9%	1%	18%
Fremont	2%	1%	-1%	-30%
Fruitvale	4%	10%	6%	130%
Glen Park	2%	2%	1%	31%
Hayward	3%	1%	-2%	-63%
Lafayette	2%	2%	1%	33%
Lake Merritt	5%	8%	3%	52%
MacArthur	4%	8%	4%	86%
Millbrae	NA	1%	NA	NA
Montgomery	2%	1%	-1%	-38%
North Berkeley	5%	8%	3%	56%
North Concord/ Martinez	1%	1%	0%	-33%
Orinda	2%	2%	0%	18%
Pittsburg/ Bay Point	1%	1%	-1%	-62%
Pleasant Hill	2%	3%	1%	55%
Powell	3%	2%	-1%	-20%
Richmond	3%	2%	-1%	-25%
Rockridge	3%	5%	2%	55%
San Bruno	NA	2%	NA	NA
San Leandro	2%	3%	1%	73%
South Hayward	2%	2%	0%	-16%
South San Francisco	NA	1%	NA	NA
Union City	2%	2%	-1%	-24%
Walnut Creek	2%	2%	0%	0%
West Oakland	1%	5%	4%	433%

Source: BART Station Profile Studies (1998 and 2008)

Table 3: Bicycle parking offered at BART stations

Parking Type	Description
Bicycle rack (outside fare gates)	Inverted U-shaped racks installed outside fare gates
Bicycle rack (inside fare gates)	Inverted U-shaped racks installed inside fare gates
Bicycle lockers (keyed)	Metal bicycle lockers that are rented on a quarterly or semi-annual basis, locked with a key, which is assigned to a single user
Bicycle lockers (electronic)	Metal bicycle lockers that are reserved on-demand using an electronic debit card issued for this purpose
Bike station (attended)	Attended valet bicycle parking facility
Bike station (self-serve)	Group bicycle parking facility with access limited to debit card holders (see electronic bicycle locker description, above)

Bicycle racks

BART stations provide a variety of inverted U racks and “wave” or “ribbon” racks (see photos).



Inverted U-racks



Ribbon rack

Passengers use their own locks to attach bicycles to each. Bicycle racks may be located either inside or outside the fare gates. Passengers’ stated preferences, occupancy rates (see Table 5) and theft statistics indicate that being located inside a fare gate makes a rack more likely to be used and more likely to protect a bicycle from theft than those outside the gates. Although the best places for bike racks at a given station must be identified on a station-specific basis, other considerations include whether or not they’re in view of the station agent booth, are in an area with frequent pedestrian traffic, have good lighting and are protected from the weather.

Bicycle lockers

Lockers, which are either keyed (i.e., reserved for one user) or electronic (and are available on a first come, first served basis), provide a higher level of security than racks by protecting the entire bicycle from theft and rain. BART is in the process of removing some keyed lockers in locations where “real estate” is limited in favor of electronic lockers that are accessed with a prepaid BikeLink⁷ card. The agency’s long-term plan is to migrate to the Clipper Card for electronic bike locker access and not to purchase additional keyed lockers. Some existing plastic keyed lockers are being removed where vandalism has been an issue.

⁷ Electronic stored value cards that allow access to bicycle lockers and automated bike stations throughout the BART system and beyond.



Bicycle lockers

Bike stations

Stations, which can be attended (“valet”) or automated and accessible with a prepaid BikeLink card, are group bicycle parking “garages,” located at or near BART stations.



Bicycle parking inventory

Most bicycle parking in the BART system is in the form of bicycle racks (62%, or 2,886 spaces), and of these, almost 90% are located outside of the fare gates (368 rack spaces, or 8% of total bike parking, are located inside the station fare gates). Two-thirds of lockers are keyed (670 out of 996 total lockers). The types and locations of bicycle parking also vary by station. The racks at some stations, such as West Dublin/Pleasanton and Castro Valley, are all located outside of and far from the fare gates, while the bicycle

parking supply of others, such as Ashby, include racks inside and outside the fare gates, lockers, and a bike station. Table 4 shows the number of bicycle parking spaces by type and location for the BART system.⁸

Is more bicycle parking needed?

According to Focus Group participants and online survey respondents, the lack of sufficient bike parking perceived as being secure is a major obstacle to bicycling to BART (see Appendix A). But do the numbers bear this out?

BART stations collectively provide over 4,500 total bicycle parking spaces (see Table 4), while an average of just 40% of spaces at each station are occupied each weekday (see Table 5). Rather than indicating excess capacity, however, this mismatch is a sign of excess supply of certain kinds of spaces (e.g., racks far from the fare gates, whose average occupancy is 22%), and an insufficient number of desirable bike parking spaces (e.g., inside the fare gates, lockers and bike stations, average occupancy 94%, 56% and 31%, respectively). Therefore, it is fair to say that, despite vacant spaces, there is a need for more bike parking, particularly certain types at certain stations.

Bicycle parking occupancy

Table 4 shows the percent of each type of bicycle parking that was occupied one clear, spring weekday in 2011, by station. The highest bicycle parking occupancy rate was at the Powell Street station in Downtown San Francisco, which primarily indicates the inadequacy of seven bicycle parking spaces at that location. At MacArthur BART, the system’s busiest transfer station located in a residential neighborhood, 92% of bicycle parking spaces were occupied. North Concord/Martinez, South San Francisco and Colma stations all had bicycle parking occupancy rates of less than 10%.

⁸ No bicycle parking is provided at SFO or Montgomery stations.

Table 4: BART bicycle parking inventory¹ (numbers indicate spaces for individual bikes)

Station	Rack supply					Locker supply		Bike stations	Total parking supply (all types)
	Outside fare gates ²			Inside fare gates	Total racks	Elec.	Keyed ³		
	Close	Medium	Far						
12th St/Oakland ⁴	-	-	62	-	62	8	-	-	70
16th St/Mission	-	-	-	77	77	-	-	-	77
19th St/Oakland ⁴	66	-	51	-	117	8	-	-	125
24th St/Mission	-	-	-	70	70	-	-	-	70
Ashby	-	122	-	14	136	-	24	128	288
Balboa Park	-	-	28	60	88	-	12	-	100
Bay Fair	28	14	-	-	42	-	16	-	58
Castro Valley	-	-	20	-	20	-	20	-	40
Civic Center	-	-	-	63	63	-	-	-	63
Coliseum/OAK	-	-	63	-	63	-	2	-	65
Colma	40	-	-	-	40	-	24	-	64
Concord	21	98	-	-	119	16	12	-	147
Daly City	-	49	-	-	49	4	-	-	53
Downtown Berkeley ⁵	-	-	20	-	20	-	-	268	288
Dublin/Pleasanton	20	10	34	14	78	12	24	-	114
El Cerrito Del Norte	-	126	-	-	126	-	28	-	154
El Cerrito Plaza	-	94	-	-	94	48	-	-	142
Embarcadero	-	-	-	-	-	-	-	96	96
Fremont	105	16	-	-	121	-	34	-	155
Fruitvale	-	49	-	-	49	-	24	200	273
Glen Park	7	21	-	21	49	-	12	-	61
Hayward	70	-	-	-	70	-	20	-	90
Lafayette	22	42	-	-	64	-	30	-	94
Lake Merrit	-	21	-	-	21	32	-	-	53
MacArthur	84	-	-	42	126	40	-	-	166
Millbrae	-	40	-	-	40	-	40	-	80
North Berkeley	8	143	-	-	151	48	-	-	199
North Concord/Martinez	-	42	18	-	60	-	16	-	76
Orinda	18	8	-	-	26	-	24	-	50
Pittsburg/Bay Point	-	-	24	-	24	-	20	-	44
Pleasant Hill	28	196	-	-	224	24	92	-	340
Powell	-	-	-	7	7	-	-	-	7
Richmond	21	-	21	-	42	16	2	-	60
Rockridge	-	69	64	-	133	32	-	-	165
San Bruno	10	-	8	-	18	-	30	-	48

Station	Rack supply					Locker supply		Bike stations	Total parking supply (all types)
	Outside fare gates ²			Inside fare gates	Total racks	Elec.	Keyed ³		
	Close	Medium	Far						
San Leandro	21	72	-	-	93	20	12	-	125
South Hayward	56	-	-	-	56	-	30	-	86
South San Francisco	-	30	-	-	30	-	30	-	60
Union City	8	-	-	-	8	-	20	-	28
Walnut Creek	21	70	-	-	91	-	64	-	155
West Dublin/Pleasanton	-	-	28	-	28	-	-	-	28
West Oakland	21	63	7	-	91	18	8	-	117
Total	675	1,395	448	368	2,886	326	670	692	4,574

Neither Montgomery nor San Francisco Airport stations have bicycle parking, and so are not included in this table.

¹ The parking inventory constantly changes. This table represents the inventory at a single point in time (May 2011).

² Close: within 25' of fare gates; Medium: within 100' of fare gates; Far: greater than 100' or not visible from fare gates. All racks outside fare gates are considered short term parking (see p. 10).

³ After the inventory was conducted, but before this plan was published, BART replaced the following numbers of keyed locker spaces with eLocker spaces: Fremont 34; Hayward 20; El Cerrito del Norte 24; Walnut Creek 48; Orinda 16.

⁴ "Far" racks and eLockers at 12th and 19th Street Oakland stations are provided by City of Oakland and are at street level.

⁵ Downtown Berkeley's bike station has 155 attended and 113 self-serve spaces.

Not enough bicycle parking was a common complaint by participants in focus groups conducted to inform this plan, especially at urban stations such as those in downtown San Francisco (see box on page 13). In some locations, this issue may be exacerbated by non-BART riders using parking, particularly at street-level urban stations, such as the downtown Oakland racks and eLockers (which are provided by City of Oakland) and attended bike stations at Fruitvale and downtown Berkeley (a joint venture with the City). Also commonly voiced was that there isn't enough information on where bike parking is located and how storage, especially bike stations and lockers, works.

Bicycle security

The perceived security of bicycle parking was also reported to be a major factor in determining where to park one's bike at a given BART station. For example, at nearly every station, among bike racks located outside the station fare gates, those that are within 10 paces, or around 25 feet, of the fare gates are occupied more than those that are within 100 feet of the fare gates or parking that is not visible from the fare gates or over 100 feet away. At the Dublin/Pleasanton

station, for example, racks classified as "close" to the fare gates are 90% occupied, while "medium" and "far" rack spaces are only 60% and 3% occupied, respectively. Racks that are located inside the fare gates are at an average of 121% of capacity (a rack can be more than 100% occupied if it is holding more bikes than it was designed to accommodate), most likely because passengers feel they are safer and more convenient than those accessible by the general public.

BART police understand that theft and the perception of theft deter some passengers from riding their bicycles to BART, and they are therefore taking steps to increase bicycle security. The force puts "hang tags" on parked bicycles, which include instructions for proper locking techniques and a place for a passenger to store important information about their bike in the event it is stolen and needs to be recovered. BART police are increasingly pursuing CPTED, Crime Reduction Through Environmental Design, whereby they participate in decisions about where to site new bike parking. And, they are increasingly analyzing bike theft data in an effort to identify trends and reduce future thefts and crime (see Appendix F for a

12-month record of bicycle theft data in the BART system).

Bicycle parking investment

Since 2002, BART has implemented myriad bicycle parking improvements at nearly all of its stations. In most cases, high levels of investment in bicycle infrastructure have corresponded to high or increasing

levels of bicycle use. For example, both Fruitvale and the Downtown Berkeley stations saw large increases in bicycle use after completing new bike stations. On average, stations with high levels of investment experienced both the greatest increase in access via bicycle and the highest rates of bicycle access. Table 6 presents a list of bicycle access improvements instituted since 2002.

Table 5: BART bicycle parking occupancy

Station	Rack occupancy ¹					Locker occupancy		Bike stations	Total parking occ. (all types)
	Outside fare gates			Inside fare gates	Total racks ²	Elec.	Keyed ³		
	Close	Medium	Far						
12th St/Oakland	*	*	21%	*	21%	88%	*		29%
16th St/Mission	*	*	*	68%	68%	*	*		68%
19th St/Oakland	62%	*	71%	*	66%	88%	*		67%
24th St/Mission	*	*	*	84%	84%	*	*		84%
Ashby	*	58%	*	150%	68%	*	25%	12%	39%
Balboa Park	*	*	14%	43%	34%	*	**		34%
Bay Fair	57%	21%	*	*	45%	*	25%		40%
Castro Valley	*	*	10%	*	10%	*	**		10%
Civic Center	*	*	*	84%	84%	*	*		84%
Coliseum/OAK	*	*	10%	*	10%	*	**		10%
Colma	8%	*	*	*	8%	*	**		8%
Concord	81%	12%	*	*	24%	0%	**		20%
Daly City	*	6%	*	*	6%	25%	*		8%
Downtown Berkeley	*	*	100%	*	100%	*	*	43%	47%
Dublin/Pleasanton	90%	60%	3%	121%	54%	33%	**		54%
El Cerrito Del Norte	*	14%	0%	*	14%	*	**		14%
El Cerrito Plaza	*	40%	*	*	40%	73%	*		51%
Embarcadero	*	*	*	*	0%	*	*	28%	28%
Fremont	30%	63%	*	*	34%	*	**		34%
Fruitvale	*	67%	*	*	67%	*	**	40%	67%
Glen Park	57%	14%	*	81%	49%	*	**		49%
Hayward	44%	*	*	*	44%	*	**		44%
Lafayette	86%	17%	*	*	41%	*	**		41%
Lake Merrit	*	86%	*	*	86%	91%	*		89%
MacArthur	86%	*	*	114%	95%	80%	*		92%
Millbrae	0%	13%	*	*	13%	*	**		13%
North Berkeley	100%	71%	*	*	73%	77%	*		74%

Station	Rack occupancy ¹					Locker occupancy		Bike stations	Total parking occ. (all types)
	Outside fare gates			Inside fare gates	Total racks ²	Elec.	Keyed ³		
	Close	Medium	Far						
North Concord/Martinez	*	5%	0%	*	3%	*	**		3%
Orinda ⁴	44%	0%	*	*	31%	*	0%		24%
Pittsburg/Bay Point	*	*	33%	*	33%	*	**		33%
Pleasant Hill	86%	36%	*	*	42%	92%	**		42%
Powell	*	*	*	100%	100%	*	**		100%
Richmond	57%	0%	0%	*	29%	0%	**		29%
Rockridge	*	71%	36%	*	54%	50%	*		53%
San Bruno	60%	0%	38%	*	50%	*	**		50%
San Leandro	43%	18%	*	*	24%	100%	33%		37%
South Hayward	16%	*	*	*	16%	*	**		16%
South San Francisco	*	7%	*	*	7%	*	**		7%
Union City	38%	*	*	*	38%	*	35%		36%
Walnut Creek ⁵	86%	44%	*	*	54%	0%	2%		47%
West Dublin/Pleasanton	*	*	39%	*	39%	*	*		39%
West Oakland	57%	30%	0%	*	34%	50%	50%		38%
Averages	52%	26%	37%	77%	43%	57%	17%		41%

Neither Montgomery nor San Francisco Airport stations have bicycle parking, and so are not included in this table.

¹ Racks with occupancy rates >100% represent those holding more bikes than they are designed for (wave racks designed for 7, U racks for 2)

² Total Rack counts do not double-count racks under rain cover (which are included either in the "outside fare gates" or "inside fare gates" counts).

³ Only visible keyed lockers (i.e. lockers with perforated doors/walls) counted

⁴ Orinda occupancy calculations assume only 8 of 24 keyed lockers whose contents were visible.

⁵ Walnut Creek occupancy calculations assume only 16 of 64 keyed lockers whose contents were visible.

* Not applicable because there is no bike parking of this type.

** Contents not visible, so occupancy was not considered in Total Parking Occupancy figures.

Table 6: BART bicycle access improvements by station* (2002-2011)

Station	Improvements
12th Street	No BART bike parking (City of Oakland facilities at street level)
16th Street	77 paid area wave racks and signage (2000). Stair channel (2007)
19th Street	64 rack spaces on concourse level (October 2010)
24th Street	70 paid area racks (2005)
Ashby	93 rack spaces added (2001/02). 12 retrofitted electronic lockers plus 24 are keyed metal lockers (2007/2008). 128-space self-service bike station (2011).
Balboa Park	30 rack spaces added (2001/02). 65 paid area racks (2006)
Bay Fair	42 rack spaces added (2001/02). 16 keyed metal lockers—from San Leandro (2007/2008)
Castro Valley	20 rack spaces, 20 locker spaces at opening (May 1997)
Civic Center	63 paid area racks (2005)
Coliseum	63 rack spaces added (2001/02).
Colma	24 rack spaces at opening, 24 keyed lockers (June 2003)
Concord	119 rack spaces added (2001/02). 16 Bicycle Parking Network—phone reservation (2005)
Daly City	32 rack spaces added (2001/02). 20 locker spaces added (2001/02). 4 retrofitted electronic lockers (2007/2008)
Downtown Berkeley	Concourse level bike station opened (1996). 268-space combined valet and self-service Shattuck Ave replacement bike station opened (July 2010)
Dublin/ Pleasanton	66 rack spaces at opening (1997). 12 retrofitted electronic lockers—from MacArthur (2007/2008)
El Cerrito Del Norte	154 rack spaces added (2001/02).
El Cerrito Plaza	94 rack spaces added (2001/02). 48 adjacent electronic lockers by City of El Cerrito (2002).
Embarcadero	130-space self-service bike station (2002)
Fremont	121 rack spaces added (2001/02).
Fruitvale	49 rack spaces added (2001/02). 200-space attended bike station (2004)
Glen Park	44 rack spaces added (2001/02). Paid area racks (2006)
Hayward	70 rack spaces added (2001/02).
Lafayette	84 rack spaces added (2001/02).
Lake Merritt	21 rack spaces added (2001/02). 12 lockers spaces added (2001/02). 32 retrofitted electronic lockers; 20 old plastic lockers removed (2007/2008).
MacArthur	84 rack spaces added (2001/02). 40 eLockers; old 30 keyed metal lockers retrofitted and moved to 3 stations (12 to N..Berkeley, 12 to Dublin/Pleasanton, 6 to West Oakland), 56 plastic lockers removed (2007/2008).
Millbrae	40 rack spaces and 40 keyed locker spaces (June 2003)
Montgomery	No bicycle facilities
North Berkeley	Covered wave racks, plastic lockers—58 spaces (1998). 94 rack spaces added (2001/02). 12 retrofitted electronic lockers (from MacArthur) plus 36 eLockers and 58 plastic lockers removed (2007/2008).

Station	Improvements
North Concord/ Martinez	30 rack spaces added (2001/02).
Orinda	26 rack spaces added (2001/02). 8 keyed lockers spaces added (2001/2002).
Pittsburg/Bay Point	24 rack spaces and 20 keyed lockers at opening (Dec 1996)
Pleasant Hill	224 rack spaces added (2001/02). 24 eLockers (2006/07).
Powell	7 paid area rack spaces (2005)
Richmond	42 rack spaces added (2001/02). 16 electronic lockers (2006/07)
Rockridge	126 rack spaces added (2001/02). 32 eLockers; 20 plastic lockers removed (2007/2008).
San Bruno	18 rack spaces and 30 keyed lockers (June 2003)
San Francisco Airport	No bicycle facilities
San Leandro	84 rack spaces added (2001/02). Swap plastic/metal lockers (2001/02). 20 electronic lockers plus 12 keyed metal lockers; 16 keyed metal lockers moved to Bay Fair (2007/2008).
South Hayward	56 rack spaces added (2001/02).
South San Francisco	30 rack spaces and 30 keyed lockers (June 2003)
Union City	69 rack spaces added (2001/02). 20 locker spaces added (2001/02).
Walnut Creek	91 rack spaces added (2001/02). 16 locker spaces added (2001/02).
West Dublin/ Pleasanton	Racks in garages on both Dublin and Pleasanton sides (2011)
West Oakland	84 racks spaces added (2001/02). 6 retrofitted electronic lockers—from MacArthur (2007/2008).

* Improvements listed are limited to those on BART property.

Source: BART, 2011

See Appendix E for a comparison of 1998-2008 change in mode share by station alongside the station improvements made during that period. As shown in Table 7, on average, stations with high levels of investment saw both the greatest increase in access via bicycle, and the highest rates of bicycle access in 2008. Comparing the access trends of Embarcadero and Montgomery stations, both in similar urban contexts, displays the importance of infrastructure investment. While a secure 130-space bike station was installed at Embarcadero in 2002, Montgomery received no investment in bicycle infrastructure. Between 1998 and 2008, Embarcadero experienced an increase of 75 daily bike riders, while Montgomery saw a decrease of 28, during a period when total daily ridership increased at both stations.

The amount of secure bicycle parking, such as keyed or electronic lockers or attended or automated bike stations, in communities with average or above-

average rates of bicycling, may be an even greater determinant of increasing bicycle access rates than the quantity of other types of parking. Indeed, the three stations at which secure bike stations were added between 1998 and 2008 (Fruitvale, Downtown Berkeley and Embarcadero) all saw large increases in access via bicycle (5.6, 4.0 and 1.4 percentage points respectively), while the Fremont station, even with the installation of 121 bike racks, saw a 0.6 percentage point decrease in bicycle access (Tables 2 and 6). The most popular stated parking choice of all online survey respondents in both groups was attended bike stations.

Table 7: Station Bicycle Mode Share by Level of Infrastructure Investment

Infrastructure improvement level*	Number of stations	Avg 2008 bike mode share	Avg % point change in bike mode share (1998-2008)
High	11	6.1%	+2.4%
Medium	22	3.1%	+0.9%
Low	7	1.3%	+0.0%
None	2	1.9%	+0.3%

* Improvement levels defined as follows: High = 100+ new spaces installed and/or attended bike station; Medium = between 30 and 100 new spaces installed; Low = fewer than 30 new spaces installed

Source: BART Station Profile Survey (1998) and BART Station Profile Survey (2008)

Onboard bicycle access

A perceived lack of safe, secure parking may have two results: it can reduce the number of passengers who bike to stations, and it can increase the number of passengers who bring their bikes onboard trains. When this plan was published in 2012, over half of passengers systemwide who biked to BART brought their standard size bike onboard a train and more passengers at three-quarters of stations brought their bikes onboard than parked at the station (see Table 8). Twenty-five percent of general online survey respondents and 28% of cycling respondents who bring their bikes onboard trains say they do so because of a lack of secure parking at their origin stations.⁹

The 2011 online survey — which shows that 54% of respondents bring their bike onboard — corroborates

this story. Although some passengers may bring their bike onboard because they need it to reach their final destination (see First/Last Mile section, below), as multiple focus group participants expressed, many bring their bikes onboard because they do not feel safe leaving them at their origin station. And recent reporting shows that bicycle thefts systemwide have risen 20% since 2006, with half of the thefts occurring at eight East Bay stations. A common remark from focus group attendees, who for the most part did not cite a need for the bicycle on the destination end of their trip, was that, if there are signs of bicycle theft or general station conditions are perceived to be unsafe, it is unlikely that many will opt to park their bicycles at BART. Furthermore, if passengers feel that the facility in which they park their bicycle is safe, they will be less inclined to take it onboard.

A perceived lack of safe, secure parking can reduce the number of passengers who bike to stations, while increasing the number of passengers who bring their bikes onboard trains.

In 2011, BART commissioned a survey of bike station users at the system's two attended bike stations: Downtown Berkeley and Fruitvale stations. Over 20% of respondents said they would bring their bike onboard the train if they didn't have access to the safe and secure bike parking that bike stations provide. With one exception, all survey respondents said that they were "very satisfied" with the bike station parking facilities, "because I know my bike is safe," to quote one respondent.

Over 20% of bike station users surveyed said they would bring their bike onboard the train if they didn't have access to the safe and secure bike parking that bike stations provide.

Although BART passengers bring their bikes aboard trains more frequently than they park them at the station, many more BART trips would likely begin with a bicycle trip were it not for BART's ban on bringing bicycles onboard train cars during specified "blackout periods." The times during which bicycles cannot be brought onboard occur in the peak direction

⁹ Between 2006 and 2011, reported bike thefts increased 20%, with an average of 520 per year over this period. Eight stations - Walnut Creek, Pleasant Hill/Contra Costa Centre, Dublin/Pleasanton, Ashby, Fremont, North Berkeley, MacArthur and Concord - accounted for half of the thefts. Source: <http://californiawatch.org/data/bike-thefts-bart-stations>, 2012

during the peak morning and afternoon commute periods. BART passengers who consider themselves to be cyclists, as well as the general public, rate the inability to bring their bikes onboard trains during commute hours as the number one deterrent to bicycling to BART. Nonetheless, BART staff consider these blackout periods necessary to avoid potential conflicts in crowded trains between standing patrons and bicycles, as well as to ensure the safety of passengers waiting on busy platforms.



Over a decade ago, BART used a 1.1 load factor (i.e., 1.1 passenger per seat ratio) to define blackout periods, based on an analysis of actual passenger loads at one point in time. Passengers with bicycles are not allowed on route segments that had a greater load factor at that time. In general, the bicycle blackout period covers weekdays 7:00 to 9:00 am and 4:30 to 6:45 pm, with the exact times varying by station because the blackout schedule prohibits bikes on certain train runs between certain stops.¹⁰ There are no blackout periods on the Richmond-Fremont line. In addition to potential passenger/bicycle conflicts inside trains, BART also seeks to avoid overcrowded platforms by instituting the following station-specific rules, which prevent passengers with bicycles from boarding to ride in the permitted non-peak direction:

- During morning commute hours, bikes are allowed in the Embarcadero Station only for trips to the East Bay.
- During evening commute hours, bicyclists traveling from the East Bay to San Francisco must exit at the Embarcadero Station.
- Bikes cannot enter or exit 12th or 19th Street Oakland stations on weekdays during the morning or evening commute periods.

Although BART passengers bring their bikes aboard trains more frequently than they park them at the station, many more BART trips would likely begin with a bicycle trip were it not for the blackout periods.

Many focus group participants cited the blackout periods as being a strong deterrent to accessing BART by bicycle. Some stated that it wasn't feasible for them to avoid them by modifying their work schedules, while others said that the ban places an extra burden on figuring out which train they can or cannot ride. Focus group participants cited the blackout ban as an example of a non-bike supportive policy because it requires riders to plan ahead to a much greater extent than other passengers. Interestingly, 43% of BART's 2008 Customer Satisfaction Survey respondents (i.e., the general riding public, which includes on average 4% riders who accessed the station by bike) would like to maintain the bike blackout ban as is, while 24% support allowing cyclists on more trains.

The BART system originally prohibited bicycles aboard all trains so rail cars (and stations) were not designed with bikes in mind. Most trains currently have no dedicated space for bicycles and none provide special seating for people with bicycles, so passengers with bikes often need to stand and hold them, while trying not to block the doors or aisles. According to focus group feedback, this awkwardness deters some passengers from bringing their bikes onboard trains because it's uncomfortable and they don't want to burden other passengers. Seven percent of online survey-takers who do not regularly ride to BART indicated that not enough space for bikes on train cars was the most significant obstacle to using their bike to access BART.

¹⁰ Most comparable U.S. transit systems ban bicycles system-wide during particular blocks of time. While more complex to understand, BART's train- and line specific blackout periods minimize the amount of time bicycles are prohibited on a given train.

Table 8: Bicycles parked versus bicycles brought onboard trains, by station

	Parked bike at station	Brought standard bike on train	Brought folding bike on train*	Brought any bike on train
12 Street/Oakland	37%	56%	6%	63%
16th Street Mission	27%	70%	3%	73%
19th Street/Oakland	42%	48%	10%	58%
24th Street Mission	50%	46%	4%	50%
Ashby	44%	48%	8%	56%
Balboa Park	15%	85%	0%	85%
Bay Fair	27%	73%	0%	73%
Castro Valley	16%	72%	11%	84%
Civic Center	40%	56%	4%	60%
Coliseum	50%	50%	0%	50%
Colma	48%	52%	0%	52%
Concord	45%	31%	24%	55%
Daly City	26%	56%	19%	74%
Downtown Berkeley	59%	40%	1%	41%
Dublin/ Pleasanton	79%	21%	0%	21%
El Cerrito Del Norte	40%	44%	17%	60%
El Cerrito Plaza	62%	35%	4%	38%
Embarcadero	11%	87%	2%	89%
Fremont	42%	49%	9%	58%
Fruitvale	44%	53%	3%	56%
Glen Park	42%	36%	22%	58%
Hayward	0%	89%	11%	100%
Lafayette	73%	27%	0%	27%
Lake Merritt	22%	74%	4%	78%
MacArthur	38%	53%	9%	62%
Millbrae	56%	44%	0%	44%
Montgomery	22%	78%	0%	78%
North Berkeley	55%	42%	3%	45%
North Concord/ Martinez	50%	50%	0%	50%
Orinda	66%	34%	0%	34%
Pittsburg/ Bay Point	32%	41%	27%	68%
Pleasant Hill	75%	14%	11%	25%
Powell	15%	85%	0%	85%
Richmond	25%	67%	7%	75%
Rockridge	35%	65%	0%	65%
San Bruno	44%	56%	0%	56%
San Leandro	32%	52%	16%	68%

	Parked bike at station	Brought standard bike on train	Brought folding bike on train*	Brought any bike on train
South Hayward	14%	72%	14%	86%
South San Francisco	58%	42%	0%	42%
Union City	21%	79%	0%	79%
Walnut Creek	85%	15%	0%	15%
West Oakland	38%	49%	13%	62%
System-wide	41%	53%	6%	59%

* Folding bikes are reported separately since, unlike standard bicycles, they can be brought onboard trains during commute periods.

Note: Sample sizes at many stations were low, so margin of error for individual stations is high.

Shading indicates more passengers brought a bike aboard a train than parked at station.

Source: 2008 Station Profile Study

Since the original prohibition of bicycles, BART has grown increasingly welcoming to bicycles onboard trains. In 1975, three years after the system opened, bicycles were allowed for the first time, but just during off-peak hours, in the rear of the last train car, and with a special permit. By 1988, bicycles were allowed in the reverse-commute direction during peak hours. Permits were abandoned in 1997 and that year marks the time when bikes were first allowed in any car but the lead car, limited by peak hour/direction restrictions. By the following year, bicycles were allowed at all times on the Richmond-Fremont line and in 1999, bicyclists could use either door in cars permitting bicycles.¹¹

To continue the trend of accommodating passengers with bicycles—as well as luggage, wheelchairs, and strollers—the current fleet of BART trains is being retrofitted. Seats near the car doors are being removed to make space for bikes and other large objects. Experimental “bike spaces” have been added to some cars, which provide a dedicated space adjacent to one set of train doors specifically for bicycles and, using bold graphics, inform other passengers that bicycles are allowed on trains (see photo).



Transporting bicycles through stations

At stations that provide auto parking, the first challenge passengers with bicycles often encounter on BART property is the design of those lots. Without dedicated bicycle entrances or lanes, cyclists must contend with drivers who can be more focused on finding a scarce parking spot and making their train than sharing access ways with bikes. An almost uniform absence of wayfinding signage directing cyclists to bike parking, fare gates, and platforms compounds this parking lot experience (see Communication section, below).

Once inside the station, BART does not allow passengers to bring their bicycles on station escalators

¹¹ San Francisco Bicycle Coalition, “A Brief History of Bikes on BART,” sfbike.org

out of space and safety concerns, which leaves carrying them on staircases or using an elevator as the only options for getting a bicycle between the fare gates and train (and, in some cases, to bike parking). Carrying a bicycle up or down stairs can be challenging, particularly for children, elderly, and disabled cyclists. Limited elevator service (which is often needed by passengers with disabilities and/or baby strollers), elevators that are often located outside the fare gates (requiring an extra trip to pay one's fare) and a majority of fare gates that are too narrow for a bicycle to pass through can also keep BART stations from feeling welcoming to bicycling passengers.

Without dedicated bicycle entrances to or lanes in BART car parking lots, cyclists must contend with drivers who can be more focused on finding a scarce parking spot and making their train than sharing access ways with bikes.

Three recent improvements have improved all of these situations:

Accessible fare gates

BART has installed wider fare gates—designed to accommodate wheelchairs, luggage and bicycles—at each station, which allow cyclists to avoid the two-step station entry and exit process whereby they exit through the emergency/disabled access swing gate with their bike, re-enter, then exit through a fare gate to pay their fare as usual. Cyclists complain, however, that these gates are not always timed to remain open sufficiently long for passengers with bikes, strollers or luggage to pass through before closing. The accessible gate at the Ashby station is cited as one that works well and could be used as a model throughout the BART system.

Stairway channels

A stairway channel is a smooth channel along the edge of a stairway that is used to roll a bicycle up and down the stairs. Since bicycles are not allowed on escalators, and elevators are often not conveniently located, stair channels are an enhancement that makes taking bikes up and down stairs more manageable. BART installed stairway channels at the 16th/Mission station in 2007. A subsequent survey administered to cyclists at that

station indicated that about 40% of bicyclists entering the station (downstairs) use the stairway channel, while about 43% use the it to exit the station (upstairs), about the same as the rate cyclists carry their bikes on stairways at that station, but much higher than elevator or escalator utilization rates.¹² Consistent with these findings, about 45% of online survey respondents who have used this stairway channel reported that it is the most convenient way to transport their bike between levels at the 16th Street station, and about the same percentage reported that carrying their bike up or down the stairs was most convenient for them.



Escalator policy

Although many passengers who bring their bicycles onboard trains want to be able to use the escalators, even if only during uncongested periods, due to safety and liability concerns, bicycles, along with strollers and wheelchairs, are prohibited on escalators throughout the BART system. During the development of this plan, BART Board members asked staff to look into lifting the ban, and members of the External Technical Advisory Committee that reviewed early drafts of this BART Bicycle Plan also voiced their support for reconsideration of the policy (see Goal & Strategies and Recommendations chapters).

¹² 16th and Mission St. BART Station Bicycle Access Survey, BART Customer Access Dept., September 2007.

Communication

Beyond policies that govern bicycle access within BART stations and on trains, and facilities that accommodate them, passengers and bicycle advocates alike cite polite and consistent communication of BART bicycle policies as essential for passengers with bicycles to feel truly welcomed by the system. Measures such as posting blackout periods on fare gates, train schedules and electronic message signs; identifying bicycle-accessible (and -prohibited) cars; and clearly signing bicycle parking locations, help communicate rules so all passengers understand the rights of and restrictions on passengers with bicycles.

Polite and consistent communication of BART bicycle policies is essential for passengers with bicycles to feel truly welcomed by the system.

Another dimension of communication is enforcement of bicycle-related rules by station agents, train operators and BART police. The consistency and tone of communication with passengers regarding bicycle storage onboard trains is critical both to maintain a welcoming attitude, even in the face of prohibiting a behavior, and to educate cyclists and other passengers about the rules. Focus group participants, advocates, and online survey respondents cite frequent cases of station agents ignoring the escalator prohibition. When one train operator refuses to depart a station until a bicyclist switches cars, while another in the same situation says nothing, all passengers—not just passengers with bicycles—are left confused.

Wayfinding signage—to stations, bicycle parking, elevators and to local destinations—helps passengers with bicycles negotiate the BART system smoothly. Some stations, such as Bay Fair, Millbrae, 24th Street Mission, 16th Street Mission, Coliseum, Richmond, San Bruno, Colma, South San Francisco, Balboa Park, and Lafayette, have minimal or no directions leading passengers to bicycle facilities, while others, such as Ashby and Pleasant Hill are cited as having good bike-specific wayfinding.

Automobile parking

In addition to bicycle-oriented infrastructure improvements, how automobiles are accommodated at a particular station also has a profound impact on bicycle access rates. According to Focus Group participants, BART's increasingly full parking lots motivate some passengers to bike to their station. Pricing policies may also help explain the increase in passengers accessing BART stations by bicycle. Between the 1998 and 2008 Station Profile Studies, BART began charging for automobile parking at 18 of its 44 stations (an additional eight have instituted paid parking since 2008, for a total of 26 today). There was an increase in access via bicycle during this period at all but two of the 18 stations (terminus stations Fremont and Dublin/Pleasanton). On average, those stations that began charging for auto parking between 1998 and 2008 experienced the largest increases in access via bicycle. The stations with large quantities of free parking tend to have the lowest rates of non-car access. Table 9 shows BART stations that began charging for automobile parking between 1998 and 2008 and the corresponding changes in access via bicycle to each.

Table 9: BART stations that charge for auto parking

Station	Daily parking fee	Year parking fee implemented	Absolute change in bike access 1998-2008
Ashby	\$1	2006	4.4%
Colma	\$2	2003	0.7%
Daly City	\$2	2003	0.6%
Dublin/Pleasanton	\$1	2006	-0.5%
El Cerrito Plaza	\$1	2007	2.8%
Fremont	\$1	2007	-0.6%
Fruitvale	\$1	2005	5.6%
Lafayette	\$1	2006	0.5%
Lake Merritt	\$1	2005	2.8%
Mac Arthur	\$1	2005	3.8%
Millbrae	\$1	2003	N/A
North Berkeley	\$1	2006	3.0%
Orinda	\$1	2006	0.3%
Rockridge	\$1	2005	1.7%
Walnut Creek	\$1	2006	0.0%
San Bruno	\$1	2003	N/A
South San Francisco	\$1	2003	N/A
West Oakland	\$5	2005	3.9%

Source: BART Station Profile Study (1998 and 2008)

First and last mile

Measures to encourage BART passengers to access stations by bicycle are not limited to those on BART property or under the agency's control. In fact, the "last (or first) mile" is cited, in the national literature and by focus group participants alike, as one of the biggest barriers to bicycling to public transit. Many stations are not well served by bicycle paths, lanes or other facilities that provide safe and continuous bicycle access. Challenges include gaps in regional bicycle path systems and multi-lane, high-speed arterials leading to BART, which, even where bicycle lanes are present, can be intimidating and even unsafe

for cyclists to negotiate. According to the 2008 Station Profile Study, the median distance from BART passengers' homes to their origin BART station is 1.39 miles, so improving bicycle access on the first and last miles is likely to go far to encourage passengers to bike to BART.

The "last (or first) mile" is cited, in the national literature and by focus group participants alike, as one of the biggest barriers to bicycling to public transit.

Other factors

Other changes that are out of the scope of this plan, but also likely contributed to increasing levels of bicycle access to BART include:

- Economic booms – such as the Bay Area experienced in 2000 and 2006 – during which the number, although not necessarily the percentage, of passengers who reach BART stations by bicycle increases. Automobile parking tends to become scarcer during these periods, another related factor that can encourage bicycle access.
- Economic downturns, like the one that began in 2008, during which passengers may look for less costly ways to reach BART.
- An increase in construction of denser housing in urban areas, including transit-oriented developments located within walking distance of many BART stations.
- A dramatic increase in gasoline prices, peaking in the summer of 2008.

3 | Goal and Strategies

Introduction

The Goal

The 2002 BART Bicycle Access and Parking Plan had a two-part goal: Enhance the attractiveness of the bicycle as an access mode and thereby increase the bicycle access mode share. The targets for this goal aimed to increase the bicycle access share from 2.5% in 2002 to 3.0% by 2010. In the last decade, BART shattered this bicycle access target, reaching 4.1% in 2010, when approximately 14,000 passengers rode a bicycle to BART on the average weekday.¹³

Table 10: Access mode from home to BART

	Percent
Walked	31.9
Drove alone	28.6
Bus/transit	15.9
Dropped off	11.5
Carpooled	5.5
Bicycle	4.1
Other	2.4
Total	100.0

Source: 2010 Customer Satisfaction Study

Based on the success of past BART bicycle access improvements and the growth in popularity of bicycle travel throughout the BART service area, and, consistent with the regional Plan Bay Area¹⁴ effort, this plan sets a systemwide goal of doubling the 2010 bike access target by 2022—in other words, striving for 8% of BART passengers to reach stations by bike by 2022.

This translates to an increase from approximately 14,000 weekday bicycle trips in 2010 to 35,000 in 2022, taking into account planned extension stations and projected ridership increases (see box on the next page). Given the aggressive level of improvements envisioned in this plan and the generally higher rate of bicycling in many of the communities served by BART, a systemwide bicycle access mode share of 8% by 2022 is ambitious, but certainly attainable, assuming resources are available to implement the strategies called for in this plan.

The goal of this plan is to double BART bicycle access, to 8% of all trips, by 2022.

Objectives & Strategies

In order to achieve the transformational goal of increasing bicycle access mode share to 8% by 2022, BART must implement a diversity of strategies that collectively address the factors that influence passengers' decisions whether or not to access BART by bicycle. The strategies outlined in this chapter seek to create a system that embraces the bicycle as the greenest vehicle access mode, which is the least expensive and most space-efficient to accommodate. Many of these strategies also support BART's transit-oriented development policy and accessibility goals for passengers with disabilities. The subset of the strategies presented in this chapter thought to be most effective at increasing the number of BART passengers who bike to BART is recommended in Chapter 5 of this plan.

Throughout this chapter, it is important to keep in mind that there are two distinct kinds of passengers who access BART by bicycle: those who park their bicycle at the station and those who bring their bicycle onboard. The priority of this plan is the first, given that there are no plans over the ten-year horizon of this plan to appreciably increase peak period train capacity.

¹³ BART Customer Satisfaction Surveys

¹⁴ Plan Bay Area is San Francisco Bay Area's region-wide planning effort to produce a more integrated land-use/transportation plan for the nine Bay Area counties. The effort prioritizes investment in development that capitalizes on rail nodes, such as BART stations, and that facilitates biking and walking to transit.

The numbers

BART tracks statistics of passengers riding trains in terms of “trips,” a one way journey from origin to destination. A typical passenger takes two trips per day, one from home and a second reverse trip later in the day. Achieving the plan goal of doubling bicycle access will mean accommodating the bicycles used for 35,000 one-way trips per weekday. If all of these bikes are parked at stations, then half the number of trips, or 17,500 spaces, would be needed. Subtracting the system’s existing bike parking supply of 4,500 spaces (from Table 4), leaves a deficit of 13,000 needed bicycle parking spaces, almost a threefold increase.

This number is surely an overestimate of needed parking since many passengers bring their bicycles onboard the train—59% of trips in 2010 (53% standard bikes and 6% folding bikes). Therefore, in order to project the number of needed bike parking spaces, we need to estimate how many people will

bring their bicycles aboard trains. Assuming the current rate of passengers parking at stations of 41%, about 7,200 bike parking spaces would be needed. This is likely a low estimate because it means that 53%, or 18,500, standard bikes would be brought aboard trains, about 11,000 more than when this plan was published. Although trains at that time had some excess capacity for bikes, and the fleet planned for roll-out beginning in 2017 may allow for longer trains, which will accommodate more bicycles, it is unlikely BART will have space for 11,000 more onboard bicycles.

A more realistic assumption would be that, rather than 59% of passengers bringing their bicycles onboard perhaps 40% (30% standard and 10% folding) would do so. This scenario would mean parking about 10,500 bikes or 6,000 more than the number of spaces available when this plan was published.

2010 and projected 2022 parked & onboard bicycles

	<i>Number</i>	<i>Percent</i>
2010 typical weekday BART trips	350,000	
Home-based bike access trips	14,000	4%
Parked at station (includes turnover)	2,870	41%
Standard bike on-board	7,420	53%
Folding bike on-board	840	6%
		100%
2022 estimated weekday BART trips	438,000	
Home-based bike access trips	35,000	8%
Assuming same park/onboard split as 2010		
Parked at station (includes turnover)	7,200	41%
Full size bike on-board	18,500	53%
Folding bike on-board	2,100	6%
Total	27,800	100%
Assuming 40% bikes brought onboard		
Parked at station (includes turnover)	10,500	60%
Full size bike on-board	10,500	30%
Folding bike on-board	3,500	10%
Total	24,500	100%

Onboard access is also important, though, to passengers who need their bicycle on the destination end of their trip or who don't feel secure leaving it at their origin station, and a majority of bicycle-related customer comments received by BART each month fall into this category. For these passengers, the plan includes strategies that improve onboard bike access and increase options for secure overnight storage and even bicycle rental at stations. Of course, strategies that will improve conditions for cyclists as they approach the station, enter the fare gates, and board the train will also make leaving the station with a bike easier and more convenient.

① Cyclist Circulation

Improve station circulation for passengers with bicycles

Once on BART property, how passengers with bicycles are greeted and accommodated at bicycle parking and directed to preferred passageways through fare gates and beyond, communicate to all passengers the bicycle's role in BART's access hierarchy. Other than pedestrians, which all passengers are at some point in their journey, cars are currently king at most BART stations. Together, the strategies outlined in this section seek to raise the visibility and importance of bicycle access within stations throughout the BART system. Cyclist Circulation strategies address the facilities that passengers with bicycles use to access, move within and depart from BART stations.

Once on BART property, how passengers with bicycles are greeted and accommodated communicate to all passengers the bicycle's role in BART's access hierarchy.

1.1 | Develop and install wayfinding signage

One of the most basic ways to encourage bicycling to transit is a clearly-communicated wayfinding system. This includes guidance regarding the safest and most direct routes to each station, indication of preferred bike routes through BART property (e.g., colored pavement), the best station and parking lot entrances for bicycles, and directions to bike parking and various means of vertical circulation at each station,

particularly for populations of limited English proficiency. A consistent, streamlined system of wayfinding, especially at stations with confusing layouts and obscure bicycle parking locations, could help clarify where safe bike routes and secure bike parking are located. Distinct signage and pavement markings unique to bicycles (e.g. a constant color and a clear bicycle symbol) would increase predictability, access and efficiency for passengers at all stations. BART could also use this directional signage on bicycle parking facilities, accessible fare gates, and bicycle priority-areas on train cars.

Capitalizing on two related efforts will help put this strategy into practice. In 2011, MTC established a new wayfinding program, being implemented by BART. The effort includes new signage design, which was first rolled out in downtown San Francisco and Ashby stations. MTC's Hub Signage Program, a regional transit information display program that will include 11 BART stations, presents another opportunity to improve the presentation of the system's bicycle-related information.



1.2 | Optimize routes between surrounding network and fare gates

The first encounter cycling passengers have with BART is the transition zone between the surrounding bicycle network and the fare gates. Making that connection clear and safe for cyclists would communicate to all passengers the importance of bicycles, while greatly improving cyclists' experience accessing BART, especially in parking lots where

vehicular conflicts are possible. Station perimeter routes with dedicated rights-of-way for cyclists, curb cuts where bicycle parking is adjacent to the sidewalk, and bikeways that are as direct as possible without creating conflicts with pedestrians will help achieve Objective #1, Cyclist Circulation.

1.3 | Evaluate and install stairway channels

All passengers need to move vertically at some point in their BART voyage, between the street and concourse and/or between the concourse and platform. This and the following two strategies address this critical component of many BART trips, particularly for passengers assisted with wheels, including wheelchairs, luggage and bicycles.

Installing stairway channels beyond the locations of the system's three existing sets—at 16th Street, Downtown Berkeley and Lafayette stations—would make carrying one's bicycle on BART's staircases easier and safer for many passengers. These concrete (or metal) mini-ramps are cut into or built onto the sides of existing staircases beneath the handrail and allow passengers to roll their bicycles as they walk up or down the stairs. Preliminary reports indicate that about half of passengers with bicycles use the 16th Street facilities, while half prefer to carry their bicycles or use the elevator or escalator (against BART policy; see Strategy 1.4). See further discussion of stairway channels in the Existing Conditions chapter.

Given the high cost of stairway channels (\$100,000/stairway), the efficacy, awareness, design and desirability of the channels at 16th Street station should be studied further. If they're found to be a worthwhile investment, criteria will be needed to determine which staircase(s) to prioritize for retrofit. Including stairway channels in BART's systemwide Facility Standards would ensure their construction at new stations.

1.4 | Revisit bicycles on escalators policy

Since carrying bicycles on stairways can be a challenge and elevators aren't always available or inviting, passengers sometimes choose to bring their bicycles on escalators, against BART policy. Although no U.S. transit agency allows bicycles on escalators, policies permitting them are in effect internationally. BART staff has reevaluated the current escalator policy and

has concluded that exposing the agency to the liability of an accident occurring as a result of dropping a bicycle on an escalator is not worth the increased convenience eliminating this ban would have for some passengers. Nonetheless, further analysis, as well as a study of policies employed elsewhere, would help inform BART's long-term policy on this issue.

1.5 | Clean elevators regularly

The slowness and lack of cleanliness of elevators, and the perception that they are unmaintained, has kept many passengers from using them. BART has increased the frequency of elevator-cleaning and monitoring, but there still is room for improvement. This investment would expand options and increase safety for passengers with bicycles, as well as for persons with disabilities, families with strollers and others.

1.6 | Install additional ADA-accessible fare gates

BART has already made significant improvements to fare gates with the addition of ADA-accessible gates at some entrances, which make passengers with disabilities, strollers, luggage and bicycles much more visibly welcome into the BART system. However, not all entrances to the system are equipped with these gates. Furthermore, due to the frequent placement of elevators outside of the fare gates, at many stations throughout the BART system, carrying one's bicycle on the elevator—not to mention using a wheelchair—often requires a repetitive trip through them.

Adding ADA-accessible gates at each entrance to every station and near elevators would increase ease of access and predictability for these passengers, discourage pushing bicycles and other large items through narrow fare gates, distribute slower-moving passengers among multiple locations and provide passengers who depend on elevators a straight-forward way to process their tickets. Timing the fare gates to allow users through at a comfortable pace would help prevent them from getting caught, which can be a painful experience. A review of the routes passengers must take to access each station, enter the fare gates and reach the platform would identify the stations that could most benefit from this strategy, and would be mutually supportive of BART's ADA access goals. Given their high capital and installation cost,

however, investment in ADA-accessible fare gates should be weighed against other bicycle-related purchases, while taking into account the mutual benefit of these gates to persons with disabilities and other passengers.

Providing plentiful secure and convenient bike parking is the most effective tool BART has to convince as many passengers as possible to leave their bicycles at the station, rather than bringing them onboard.

② Plentiful Parking

Create world-class bicycle parking facilities

Bicycle parking is the most visible, symbolic and arguably the most important component of the BART system in terms of its potential to encourage passengers to access stations by bike. Bicycle parking provides an opportunity for the agency to make a bold statement to all passengers about the importance of bicycles as an access mode. Providing plentiful secure and convenient bike parking is also the most effective tool BART has to convince as many passengers as possible to leave their bicycles at the station, rather than bringing them onboard. The bicycle parking strategies that correspond to this objective address the barriers to bicycle parking passengers currently face, including risks of theft and weather and to personal safety.

2.1 | Provide adequate bicycle parking of each type

Adequate bicycle parking is essential to increasing bicycle access to BART. The BART Bicycle Investment Tool will help determine the amount and type (e.g. racks, lockers or station, sheltered from rain and the sun, etc.) of parking recommended for each station, consistent with Association of Pedestrian and Bicycle Professional (APBP) standards. As important as ample quantities of parking are the station-specific location decisions for each investment. Bicycle parking in the paid area and along other visible, well-traveled pathways will always be more secure than parking in more isolated parts of the station (see Existing Conditions chapter).

2.2 | Fight bicycle theft

Building plentiful, secure bike parking will go a long way toward protecting BART passengers' bicycles. Lighting in bicycle parking areas will increase the security of passengers and their bicycles. Beyond these concrete changes, encouraging passengers to report incidents of theft and tracking theft data more closely will help BART staff get a better handle on trends and hot spots. Specific measures include improved reporting forms and databases, so that how and where stolen bikes were locked can be tracked; regular review of security videos; and better communication between BART police, bicycle planning staff and BART's Bicycle Accessibility Task Force. These recommended actions will help BART target sting operations, parking investments, safety campaigns and other theft prevention efforts. These efforts can extend to educating riders on proper locking techniques and recording and storing their bicycle's serial number.

2.3 | Maintain bicycle facilities more frequently

Vandalized bicycles send a clear message to current and potential cyclists that their bicycle would not be safe parked at a BART station. Routinely removing such bikes, at least quarterly, would help convey to thieves and passengers that the system is paying attention to theft and vandalism. Similarly, keeping other bicycle facilities in good repair maximizes the number of bicycles that can be stored at each station, while communicating that BART cares about its passengers' belongings.



2.4 | Expand bicycle parking payment options

Expanding payment options for eLockers and self-serve bike stations would make the journey more efficient for passengers using these facilities and more accessible to those wishing to use them. Allowing passengers to use Clipper Cards to pay for bike parking would also reduce the number of payment systems BART must manage (see Existing Conditions chapter). Until bicycle parking payment with Clipper cards is established, expanding the availability of BikeLink cards to retail outlets would allow eLocker payment for passengers without online access or a credit card. Multilingual information on all payment options would make secure parking more accessible to passengers with limited English proficiency.

2.5 | Manage eLocker availability through vacancy targets and price variation

Although parking at BART station bicycle racks is free, eLockers charge a nominal fee, meant to discourage passengers from using the eLockers for long-term storage. BART policy allows the rate to be set at between one and seven cents per hour, with each station permitted to have its own rate. Despite the ability to vary eLocker fees, currently BART charges a uniform three cents per hour throughout the system. Beyond adding eLockers where appropriate (see Strategy 2.1), varying pricing to maintain target occupancy levels (e.g. 85%); increasing the hourly rate with higher occupancy levels, perhaps beyond the maximum currently allowable; and publicizing the hourly rates would take advantage of one of their unique features, while improving management of BART's system of electronic lockers.

3 Beyond BART Boundaries

Help assure great bicycle access beyond BART's boundaries

Although BART does not have authority to make improvements outside of the agency's property, without safe and convenient bicycle routes to each station, the system cannot hope to substantially increase its bicycle access mode share. The strategies in this section seek to optimize BART's impact on changes that increase passengers' ability to access and depart from stations by bicycle.

Without safe and convenient bicycle routes to each station, BART cannot hope to substantially increase its bicycle access mode share.

3.1 | Evaluate and implement bicycle sharing at BART stations

Bicycle sharing is an arrangement whereby a fleet of publicly owned bicycles is available on demand at transit stations and other nearby destinations. These systems are proving to be highly effective at encouraging short bicycle trips in metropolitan areas around the world. Particularly successful applications are with "first/last mile" trips to/from transit stations (see Existing Conditions chapter). Bicycle sharing can allow public transit to be a travel option for people whose destinations are beyond walking distance, but within biking distance, of a station. It can also prevent some passengers from having to bring their bicycles onboard trains who do so because they need them on the destination end of their trip. In the BART context, a passenger exiting at a given station would check out a bicycle and ride to their ultimate destination, presumably near another bikeshare station¹⁵, where they would leave the bike until it's time to return to the BART station. Smart card technology allows for automated check-in and -out of bikes and virtually eliminates theft, which plagued early programs. By spring 2013, a one thousand-bicycle Regional Bike Share program will have launched in San Francisco, the Peninsula and San Jose, including bikeshare stations near all the downtown San Francisco BART stations and a likely future expansion to additional BART station areas. Monitoring this program and, if successful, studying and implementing other bicycle sharing pilot programs in collaboration with local agencies and private partners would expand the number of passengers living and working within a short distance of BART who can bike to reach a station.

¹⁵ A bikeshare "station" is composed of one "kiosk" (the ATM-like pay station) and multiple "docks" (which each secure one bicycle).

3.2 | Support local efforts to improve bicycle access to stations

Where BART does not have jurisdiction to make changes—such as on local streets and pathways—supporting local efforts to fund and implement bicycle facilities that serve BART stations would help make these improvements happen. BART assistance could take the form of letters of support and participation in local meetings. Many of these bicycle access improvements may have been included in one of the dozen or so recent MTC and Caltrans-funded Station Area Plans that covered locations near BART stations, including access routes, wayfinding signage, parking at downtown stations or other facilities in local agencies' jurisdiction (see Appendix G write-up in the Introduction chapter for a list of these stations). In addition, the East Bay Greenway—a planned 12-mile corridor linking five BART stations in Oakland, San Leandro and Hayward—offers a unique opportunity for BART to work with local jurisdictions to develop this “trails-to-transit” facility on property BART partly owns. A list of needed projects identified in other plans is included in Appendix G; Appendix D contains additional improvements suggested by advocacy groups and countywide bicycle/pedestrian advisory committee members. In addition, there are many opportunities for the agency to leverage private funds to accomplish the shared goal of increasing BART patronage. In particular, large businesses located just past walking distance of a station would need to provide less automobile parking if more employees could bike to work.

3.3 | Create station area maps with recommended bike routes

Local area maps for each station would help make BART passengers' journeys to their final destinations safer and more efficient. The maps could include local bicycle networks, major destinations and bicycle shops in the vicinity of each station. The reverse side of printed maps could provide information on BART bicycle programs and policies. Displaying the maps in each station, providing pocket maps, and posting them online would help expand BART's reach and suggest bicycling to passengers who may not have otherwise considered it.

4 Bikes on BART

Optimize bicycle accommodations aboard trains

Unlike the previous three objectives, onboard access strategies involve BART operations and car design. This objective acknowledges that passengers sometimes need their bicycle at the destination end of their BART ride and therefore bring it onboard. Regardless of the strategy, clearly communicating to all passengers where, when and how bicycles can be safely and conveniently stored on train cars would help demonstrate the importance BART places on bicycles and on other passengers' right to a grease-free ride.

Clearly communicating to all passengers where, when and how bicycles can be stored on train cars would help demonstrate the importance BART places on bicycles and on other passengers' right to a grease-free ride.

4.1 | Provide space for bicycles in new BART cars

Allocating space specifically for bicycles on the next generation of BART cars communicates welcome-ness to passengers with bicycles and helps prevent bicycles from interfering with other passengers. BART is currently experimenting with bicycle-priority areas in select cars and will be putting into service cars with improved designs beginning in 2017. New car designs at the time this report was written include an extra door on each side—three in total—and a bike-priority area with racks for three bikes near the middle door of every car. A better-designed bicycle-priority area, folding seats and on-board stabilizing mechanisms would assist passengers with bicycles, reduce passenger conflicts, and accommodate bicycles efficiently. In addition to these features, which are currently being pursued by BART, another concept recommended by focus group participants and one of the most common BART customer suggestions is special train cars that prioritize bicycle accommodation by providing more of these amenities than a typical car, similar to Caltrain's bike cars.

4.2 | Evaluate blackout periods

BART established “blackout periods” during which bicycles are prohibited on trains (and on platforms at

especially congested stations) to maximize the number of passengers that can fit on peak period trains, while preventing conflicts that may arise when bicycles are carried onboard crowded trains. Shifting from this approach to the sort used at other transit agencies, whereby bicycles are allowed on trains anytime, as long as train cars aren't too crowded, is a move that should be tested on the BART system.

Current blackout periods were determined to minimize the time bicycles are banned from BART cars. As a result, periods vary between stations and can therefore be difficult to remember. If blackout periods remain on BART trains, simpler time periods should be considered to make the policy easier to understand and learn by heart; however, if established on a systemwide basis, this standardization would also reduce onboard bicycle access at any given station. If lifting the blackout periods entirely is proven to be unworkable, an evaluation of the current time periods is needed to balance these effects, rationalizing the times without reducing onboard access.

4.3 | Develop a folding bicycle incentive program

Unlike full-sized bicycles, folding bikes can be carried onboard trains at any time. For passengers who need their bicycle on both ends of their trip, a cost-effective way for BART to encourage this option would be to loan or give away folding bicycles on a promotional basis.

5 Persuasive Programs

Complement bicycle-supportive policies and facilities with support programs

BART programs that complement bike-supportive policies and investments will increase the effectiveness of all efforts. The programs in this section suggest strategies aimed at BART staff and passengers alike.

BART programs that complement bike-supportive policies and investments will increase the effectiveness of all efforts.

5.1 | Educate passengers and staff on use and benefits of bicycles

Many passengers do not know the full range of resources available for accessing, parking and boarding BART with bicycles. Publishing tips on the use of the system's bicycle facilities and making them widely available through multiple media would help passengers feel more confident about their options. Public campaigns that explain how to best prevent bike theft, eLocker and bike station use, and how "bikes benefit everyone" are all positive ways to educate and attract more cyclists. Encouraging BART staff to take BART to work, and bike to their home station, would help provide the agency with "experiential knowledge" that will help them better accommodate cycling customers.



5.2 | Improve communications with customers on BART bicycle policies and facilities

Clear, consistent and positive language about BART's bicycle-related policies would make stations safer and circulation easier for all passengers. Pertinent policies include where bicycles can be safely ridden, how best to travel with a bike between BART station levels, and when bikes can be brought onboard trains. Placement at the appropriate decision-making points is as critical as the information itself, including outside fare gates, on the platform Destination Sign System (DSS), at escalator loading areas and at train doors. Continuing to train staff in the use of positive language when communicating BART policies would also improve the customer experience for cyclists. Online information, rules and user guidelines would also reinforce and improve BART's appreciation of how responsible

bicycle use can help all passengers. And, since communication works both ways, the ability of passengers to text comments to BART on bike-related issues, such as broken eLockers or bike parts locked to racks for months, would help BART better maintain the system while collecting potentially useful data.

5.3 | **Create bicycle program in BART Capital Improvement Plan**

A bicycle program in the BART Capital Improvement Plan would demonstrate the agency's commitment to doubling bicycle access to stations and to implementing this plan's recommendations. The bike program budget would fund improvements such as bicycle parking, wayfinding infrastructure, stair channels and other capital-related strategies.

5.4 | **Collect access mode data before/after bicycle improvements**

This plan and the companion investment tool emphasize bicycle parking in part because it is the facility about which BART has collected the most data. Even so, the absence of bicycle access counts before and after installation of bicycle parking, stairway channels and other bicycle-related facilities prevents more robust analyses. If BART collected this data, there would be more of a basis for particular investments in bicycle infrastructure and programs, which would also help improve the usefulness and accuracy of the Bicycle Investment Tool.

5.5 | **Increase automobile parking fees**

Automobile parking fees reflect the extra service provided to passengers accessing BART by car, yet compared to market rates, most stations undercharge for parking or do not charge at all. As shown in the Existing Conditions chapter, there is a strong correlation between auto parking fees and bicycle access: on average, stations that offer the most free parking have the lowest bicycle access rates, and when stations begin charging for auto parking, more passengers begin to bike there. Market-based parking fees at all stations would encourage passengers to consider alternative means of accessing BART, help manage auto parking availability, and potentially provide funding for bicycle facilities in the system. Related would be a strategy of evaluating how much bicycle parking could take the place of automobile

parking that BART and its private partners replace with transit-oriented development.

5.6 | **Participate in more Bike-to-Work day events**

Annual Bike-to-Work Day (BTW) events throughout BART's service areas are designed to encourage Bay Area residents to try bicycling to work as an alternative to the single-occupant vehicle. Because combining biking with BART can also replace vehicle trips, BART historically allows Bike-to-Work Day "Energizer Stations" (booths that serve refreshments to BTW Day participants) on BART property. The agency could increase its participation in these events by staffing booths and providing incentives to participants.

5.7 | **Update station standards for bicycle facilities**

BART's Facilities Standards is a living document that currently includes standards for bicycle facilities. Updating this guide on an ongoing basis will help BART staff evaluate needed improvements at each station and design new stations to the highest standards.



4 | Modeling Future Investment

Introduction

The previous chapter of this plan lays out an ambitious goal and set of strategies aimed at increasing the number and proportion of passengers who reach BART stations by bicycle. These include improving station circulation for passengers with bicycles, creating world-class bicycle parking facilities, optimizing bicycle accommodations aboard trains, helping assure great bicycle access beyond BART's boundaries and developing support programs that complement new bicycle-supportive policies and facility investments.

To be sure, investment in more secure and convenient bicycle parking and other improvements to stations and the bikeways leading to them will increase the visibility and importance of cyclists to the system, presumably increasing the number of passengers who choose to travel to BART by bicycle. Less clear is the specific impact a given investment can be expected to have. In other words, with a given amount of funding, how and at what stations should BART invest to generate the most new riders and encourage the most existing drive access passengers to shift to bicycling? Related, what is the effect on access of increasing the number of trains on which bicycles can be brought? Equally important is the ability to compare potential bike-related projects to the same investment in other access modes in order to predict which will generate the most new passengers per dollar, particularly relative to the most popular current BART access mode for home-based trips, the single-occupant automobile.

With a given amount of funding, how and at what stations should BART invest to generate the most new riders and encourage the most existing drive access passengers to shift to bicycling?

An exciting component of this BART Bicycle Plan is a new bicycle access model, developed to help BART and other commuter rail operators predict the effect of an assortment of bicycle-related investments on

bicycle access rates, and to compare these investments to the cost of providing automobile parking. Although based primarily on BART data, the model and companion spreadsheet tool are designed to be used and adapted by a broader range of transit operators.

Find the Bicycle Investment Tool at:

<http://bart.gov/guide/bikes/investment.aspx>

This chapter describes users that could benefit from this spreadsheet tool, its uses, and required inputs and outputs. Appendix H provides a Users' Guide to the tool; and Appendix I describes the model development process, including assumptions and data challenges. While not necessary for using the spreadsheet tool, the background information in Appendix I will be interesting for those wanting to study the groundbreaking process used to develop the model and tool, and will come in handy for practitioners hoping to improve upon this first generation model.



Who should use this tool and why

The typical user of the Bicycle Investment Tool, which employs an Excel spreadsheet interface, is a commuter or urban rail planner wishing to predict the effect of a variety of investments on ridership, access and whether a bike access passenger will park at the station or bring their bike onboard a train. The tool is programmed with specific and detailed information

for the BART system as described later in this chapter; however, it is designed to be flexible and easy to use by other rail operators as well. While BART planners can rely on pre-programmed station-specific data collected by BART, other transit operators can also use the tool by categorizing their stations according to the most appropriate BART station “typology” (see Existing Conditions chapter and Table 11).

Table 11: BART station typologies

Station typology	Description	Example BART stations*
Urban	High-ridership with high walk, bike and transit access share. No parking provided. Can be found in downtown or neighborhood business district	12th Street Oakland, Downtown Berkeley, Embarcadero
Urban with parking	Similar to “Urban,” but with small parking lots that fill up early. Auto mode share is higher than “Urban.”	Ashby, Lake Merritt, North Berkeley
Balanced intermodal	Well-served by transit that serves primarily corridor and local transit. Parking provided, but fills early due to size. Can be found on urban or suburban grid network. Walk access mode share is moderate.	Fruitvale, MacArthur, Rockridge
Intermodal—auto-reliant	Well-served by regional and local transit. Large amounts of parking provided. Can be found on suburban grid or residential area. Walk access share is lower than average.	Daly City, El Cerrito del Norte, Walnut Creek
Auto dependant	Focus on auto-based access. Large station footprint, structured and/or surface parking, and adjacent highway access. Walk and transit access share predominantly below average.	East Dublin/Pleasanton, Lafayette, Pittsburg/Bay Point

* To help determine the most accurate station typology to apply to a given non-BART station, see www.bart.gov/stations/index.aspx for links to more details about each BART station.

BART staff envisions using the tool in at least three ways:

- 1. Prioritizing investment:** When opportunities arise to make improvements at a given station, for instance, when other station modifications are being planned, the tool can help identify the best bicycle-related investments. The tool can also help prioritize systemwide investments, like the purchase of hundreds of electronic bike lockers.
- 2. Justifying BART funds:** As described later in this chapter, the investment tool can estimate the increased number of passengers arriving at a given

station by bike as a result of particular investments. Whether these riders are new to the system or have switched from driving, thereby freeing up costly automobile parking spaces, this shift can represent additional fare revenue, which could be allocated to making the improvements.

- 3. Predicting benefits:** Competing for outside grants increasingly relies on the ability to quantify the benefits of the investments for which funding is being sought. These benefits include increased ridership and reduced auto access VMT and resulting pollutants, all calculations the tool can help develop.

Model inputs and outputs

The Excel spreadsheet tool contains the following seven tabs or worksheets:

1. **Instructions**, including an overview of the Tool's contents and disclaimers
2. **Assumptions and Constraints** of the bicycle access model
3. **Bicycle Parking Facility Costs**, per unit
4. **Bicycle Parking Investments Inputs**, which requires the user to input the information outlined in Table 12 for their investment scenario
5. **Bicycle Parking Investments Summary**, which provides an evaluation of the selected investment scenario
6. **Support Strategies**, as described in the Goal and Strategies chapter, which allows the user to select station- and system-level strategies for inclusion in the overall summary page
7. **Overall Summary**, which provides a summary of the bicycle parking investments, associated costs and projected increase in daily bicycle access as shown in Table 13, as well as the selected support strategies

Investment tool inputs

The primary difference between using the Bicycle Investment Tool for the BART system and for other transit operators is the data inputs. While station-specific data is built into the BART model, other transit systems must either use the station typology defaults, manually enter local data or some combination of these two sets of inputs.

In the Bicycle Parking Investments Input tab, all users—whether planning for BART or another rail system—must choose a scenario year (i.e., when the planned improvements would be made) and total budget (capital and annual operating costs). BART planners then select from a pull-down menu of stations that were in operation as of 2012, when this plan was published. Investment tool-users from other systems (and BART analysts looking at extension stations) represent the station being studied by choosing the most comparable BART station typology, whose default input values are the average value of all BART stations of that typology. When local values are

known for one or more variables, the user can easily override the average typology value.

Next, a bicycle mode share goal is entered. For instance, 8% for 2022 would be consistent with this plan's goal, although the number would likely vary from station to station. The tool then populates fields for base year characteristics (nearby population, employment and intersection density, auto and bicycle parking supply, and the percentage of trains serving the station that allow bicycles onboard)—for BART stations, based on actual data; for stations using typologies, based on the average values for BART stations of that typology. Actual base year bicycle parking supply and occupancy is automatically populated for BART stations. Planners at other systems (or BART planners in future years) must enter actual bike parking supply figures; occupancy can revert to default typology averages or be overridden with actual occupancy data.

Finally, the user can experiment by trying various combinations of up to six varieties of bicycle parking¹⁶ that fit within the established capital and annual operating budgets. Checklists of other recommended station-specific investments are included on subsequent spreadsheet tabs, but because BART does not have data on their potential effect on ridership, these strategies are included in a more qualitative manner than parking-related investments. See Table 12 for a list of inputs and Figure 2 for sample screen shots of the tool's input fields. See Appendix H for a complete User's Guide to the investment tool.

¹⁶ Parking options include bicycle racks inside and outside the fare gates, keyed and electronic lockers, attended and self-serve bike stations, and bicycle cages. See Existing Conditions chapter Table 3 for a description of each, with the exception of bicycle cages—either locked or unlocked enclosed areas containing a collection of bicycle racks—which don't currently exist in the BART system.

Table 12: Inputs to Bicycle Investment Tool

- Scenario year
- Bicycle parking facility costs (can use default)
- Investment budget (capital and operating)
- BART station or station typology
- Mode share goal for scenario year (can use default)
- Base year station area characteristics (can use default)
- Total station ridership (can use default)
- Base year bicycle parking supply & occupancy by facility type (can use default for occupancy)
- Supporting bicycle strategies

Investment tool outputs

Once station inputs have been entered (either by using the automatic typology-based or local values), the Bicycle Investment Tool functions identically for stations outside the BART system as for BART's own stations.

The user can experiment with different values for the number of bicycle parking spaces of each type. Each

time a promising scenario is created, the Bicycle Parking Investments Summary tab shows the scenario's ratio of short-term to long-term parking and predicted effect on the number of weekday passengers that can be expected to access a given station by bike. This number is then split into those who are projected to park at the station and those who may instead bring their bikes onboard a train. The Overall Summary tab also provides much of this information, plus investment cost, cost per rider and return on investment (see Table 13 and Figure 3).

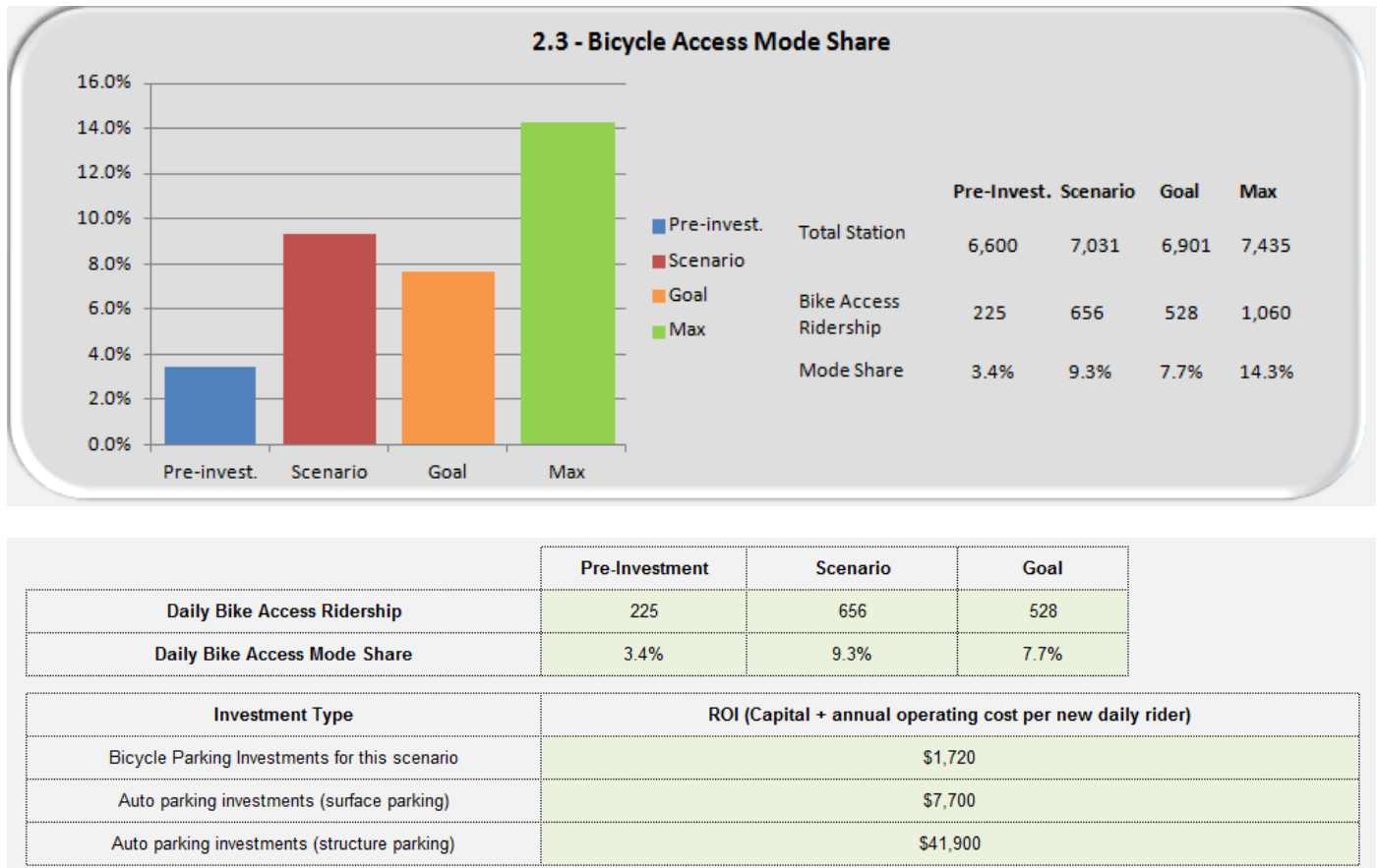
Table 13: Outputs from Bicycle Investment Tool

- Ratio of short-term to long-term bicycle parking
- Daily bicycle access ridership increase by parking investment
- Change in bicycle access mode share
- Number of parked versus onboard bicycles
- Cost of bicycle investments and cost per new bike access passenger
- Return on (bicycle parking) investment

Figure 2: Bicycle Investment Tool—Inputs for Bicycle Parking

Station Area Characteristics		
Population within 1/2 mile radius of station	<input type="text"/>	6,139
Unreserved vehicle parking spaces provided at station	<input type="text"/>	83
Non-blackout percentage	<input type="text"/>	92 %
Bicycle Parking		
Bicycle rack spaces outside fare gates	<input type="text"/>	21
Bicycle rack spaces inside fare gates	<input type="text"/>	0
Keyed locker spaces	<input type="text"/>	0
Electronic locker spaces	<input type="text"/>	32
Self serve bike station spaces	<input type="text"/>	0
Attended bike station spaces	<input type="text"/>	0
Security of bicycle parking rating	<input type="text"/>	0.9
Lighting of bicycle parking rating	<input type="text"/>	1.2

Figure 3: Bicycle Investment Tool—Sample Outputs



Model and tool context

As pioneering as the BART bicycle investment model and tool are, it is important to understand that, in the BART system at least, their output will be but one mechanism among many bicycle-related decision-making factors. This list includes opportunities presented by other projects, such as station renovations; grants aimed at a particular type of investment or geographic location; and, of course, observed demand at stations where existing facilities are routinely oversubscribed.

bike station

EXIT

2208

is an everyday
on and recreation
Inside
support

bike
station
mon - fri
9 a.m. - 5:00 p.m.



5 | Recommendations

Introduction

To double bicycle access by 2022, BART must implement a diversity of strategies expected to most effectively influence passengers' decisions to access BART by bike. The Goal and Strategies chapter catalogued a set of potential strategies for accomplishing the goal of achieving 8% bike access by 2022 and divided them into five objectives:

- 1 **Cyclist Circulation:** Improve station circulation for passengers with bicycles
- 2 **Plentiful Parking:** Create world-class bicycle parking facilities
- 3 **Beyond BART Boundaries:** Help assure great bicycle access beyond BART's boundaries
- 4 **Bikes on BART:** Optimize bicycle accommodations aboard trains
- 5 **Persuasive Programs:** Complement bicycle-supportive policies and facilities with support programs

The focus of this chapter is on the subset of strategies presented in the Goal & Strategies chapter expected to be most effective at encouraging passengers to travel to BART by bike, including those using current and future extension stations. This narrative explains why each was prioritized, and discusses how, together, these strategies will help achieve the ambitious goal of doubling bicycle access to BART by 2022. These recommended strategies will also improve the experience for other passengers, including persons with disabilities; encourage more passengers to try bicycling to BART, thereby freeing up scarce auto parking; and potentially increase BART ridership and revenue.

Each recommendation applies either systemwide or just to certain stations. Systemwide recommendations include strategies regarding blackout periods, train car design and public campaigns to make the system more welcoming of cyclists, as well as other strategies, such as wayfinding design, escalator policy and elevator maintenance, that apply to every station in the system. For station-specific strategies, BART will need to

consider the unique needs and opportunities of each one and identify the mix of strategies that are most likely to attract more passengers to access that station by bicycle. In certain situations and at certain stations some of the recommended strategies will be more valuable than others; therefore, they are not prioritized. Unlike BART's original stations, which were not planned to accommodate bicycles, extension stations provide a particularly good opportunity to design and install excellent bicycle parking before the stations open. The investment tool described in the previous chapter can help estimate appropriate levels of parking of each type at these stations.

Criteria for Recommended Strategies

Each of the strategies in this chapter is recommended based on an array of criteria, which ask questions about its importance to a "bike-friendly" transit system, ease of implementation, effectiveness at attracting new cyclists and cost. These criteria are summarized below.

How important is the strategy to a bike-friendly transit system?

The first criterion for selecting the strategies recommended in this chapter was a rather subjective determination of the basic measures a transit system striving to be considered "bicycle-friendly" should take. All strategies presented in the Goal and Strategies chapter will improve bicycle access, but according to nationwide best practices and Bay Area experience, if BART is serious about achieving the goal of this plan there are essential facilities to install and policies to implement.

How effective is the strategy at encouraging bicycle use?

A second criterion used to select the strategies BART should implement is separating those expected to increase bicycle access from those that merely facilitate it. In other words, will the strategy encourage drive-access passengers to try biking to BART or attract new passengers to the system, or purely make biking to BART more pleasant for those already doing so? The

satisfaction of existing customers is tracked closely by and is extremely important to BART, but this criterion acknowledges that, to double the system's bicycle access rate, we need to attract new bike access passengers.

How easy is the strategy to implement?

Another important consideration when selecting the highest priority strategies for BART to pursue is ease of implementation. The agency should select a mix of strategies, ensuring that some can be carried out soon after adoption of this plan, even as others are in the planning stage.

How expensive is the strategy?

The true cost of an investment cannot be known until any avoided costs are calculated. For instance, an attended bike station may have higher operational costs than other types of bicycle parking, but if it lures more passengers out of their cars, it may have a lower net cost to the system. Nonetheless, project cost is especially relevant in a time of diminished resources, when BART will need to rely on grants for many bicycle-related improvements.

Will the strategy also benefit other BART passengers?

Some improvements to BART stations that encourage and highlight bicycle access also help other passengers, particularly those with mobility challenges. Having this added benefit is another criterion that was used to prioritize the strategies presented in this chapter.

Recommendations

The strategies recommended in this chapter are the subset of those presented in the Goal & Strategies chapter that are expected to best help achieve the goal of doubling bicycle access to BART stations by 2022. For more details on each of the five objective categories, as well as the strategies themselves, please refer to the Goal & Strategies chapter, which presents more comprehensive descriptions. The write-ups in this chapter focus on how and why it is recommended that BART staff focus on carrying out these particular strategies.

Recommended strategies

1 Cyclist Circulation

- 1.1 Develop and install wayfinding signage
- 1.2 Optimize routes between surrounding network and fare gates
- 1.3 Evaluate and install stairway channels
- 1.4 Revisit bicycles on escalators policy
- 1.5 Clean elevators regularly

2 Plentiful Parking

- 2.1 Provide adequate bicycle parking of each type
- 2.2 Fight bicycle theft
- 2.3 Maintain bicycle facilities more frequently
- 2.4 Expand bicycle parking payment options

3 Beyond BART Boundaries

- 3.1 Evaluate and implement bicycle sharing at BART stations
- 3.2 Support local efforts to improve bicycle access to stations
- 3.3 Create station area maps with recommended bike routes

4 Bikes on BART

- 4.1 Provide space for bicycles in new BART cars
- 4.2 Evaluate blackout periods

5 Persuasive Programs

- 5.1 Educate passengers and staff on use and benefits of bicycles
- 5.2 Improve communications with customers on BART bicycle policies and facilities
- 5.3 Create bicycle program in BART Capital Improvement Plan
- 5.4 Collect access mode data before/after bicycle improvements
- 5.5 Increase automobile parking fees
- 5.6 Participate in more Bike-to-Work day events

1 Cyclist Circulation

1.1 | Develop and install wayfinding signage

A coordinated system of bold, clear directional signs aimed at cyclists within the BART system would simultaneously communicate the importance of bicycles in BART's access mode hierarchy; draw attention to each station's bicycle parking facilities, accessible fare gates and, where appropriate, stairway channels and other facilities designed to promote bicycle access to the system; and suggest to other passengers the convenience of accessing the station in an alternative way. In wayfinding and signage design, BART should especially consider the needs of passengers of limited English proficiency and publish outreach materials in multiple languages, using international symbols whenever possible. BART should coordinate bicycle wayfinding with MTC's Hub program, as well as with its own ongoing efforts to create a unique, branded program, such as at the Ashby and downtown San Francisco stations.

1.2 | Optimize routes between surrounding network and fare gates

Once cyclists reach a BART station, their journey to the fare gates is not over. Retrofitting parking lots with dedicated bike lanes and, as needed, sidewalks with parallel pathways, will help separate motor vehicles and pedestrians from bikes, while, like wayfinding signs, communicating to all passengers that bicycling is a safe, alternative way to reach BART. In addition to retrofitting stations, BART should incorporate direct and safe bicycle routes into station planning efforts.



1.3 | Evaluate and install stairway channels

BART's design as a subway and above-ground system means passengers have to change levels in order to reach trains at all stations. Stairways, escalators and elevators are provided for these transitions, but none are ideal for nor serve to welcome passengers with bikes. Bicycles are currently prohibited on the system's escalators (see Strategy 1.4) and elevators can be slow and are better prioritized for passengers who don't have an option, such as those using a wheelchair or pushing a stroller. Since many passengers find it difficult to carry bicycles on stairways, BART has installed a limited number of "stairway channels," mini-ramps that parallel stairways, thus allowing cyclists to roll their bikes as they walk up or down stairs (see Existing Conditions chapter). Although costly to retrofit onto existing stairways, channels can reduce these barriers while sending a message that BART welcomes cyclists at every step of their journey. To implement this strategy, BART should evaluate the stairway channels at the 16th Street station and, depending on the findings, create design standards for stairway channels and criteria to determine which stairways in the system should be retrofitted first.

Retrofitting parking lots with dedicated bike lanes and, as needed, sidewalks with parallel pathways, will help separate motor vehicles and pedestrians from bikes, while communicating to all passengers that bicycling is a safe way to reach BART.

1.4 | Revisit bicycles on escalators policy

At the behest of passengers who find carrying their bicycles on escalators to be the easiest option for moving vertically, BART staff has re-examined the agency's long-standing prohibition of bicycles on escalators. Although they have concluded that the ban should not be lifted due to safety and liability concerns (see Existing Conditions chapter), this policy deserves review because of the high cost of stairway channels, the inconvenience and unpleasantness of some BART elevators and the perceived unfairness of banning bikes on escalators, but not other large items, such as luggage. BART's study should evaluate the effectiveness and enforcement of the prohibition, investigate transit systems internationally that permit bikes on escalators, and evaluate if there are safety

differences between carrying a bicycle, versus resting one, on an escalator.

1.5 | Clean elevators regularly

Although BART maintenance crews clean station elevators more frequently than in the past, actual and perceived filth and stench are major barriers to using them. Regularly cleaning and monitoring elevators would help discourage passengers with bicycles, strollers and luggage from using escalators (see Strategy 1.4) and greatly improve the BART experience for passengers with disabilities who are unable to use stairways or escalators.

2 | Plentiful Parking

2.1 | Provide adequate bicycle parking of each type

Bicycle parking that passengers can depend on to be available, secure and sheltered from weather, is arguably the most effective way to increase bike access to BART. Well-designed, -sited and -maintained bicycle parking communicates to all BART passengers that bikes are an essential part of the BART system. BART should prioritize square tube, inverted U rack design for new racks and collaborate with BART police when siting bicycle parking. Parking should be placed inside the fare gates, visible to the station agent or adjacent to main paths of travel wherever possible. When selecting the type of bike parking at a given station, BART should balance that some types of bicycle parking have a user cost and therefore may not be as accessible to passengers of limited economic means, with the desire to provide a variety of parking options. The Bicycle Investment Tool developed in conjunction with this plan and described in the previous chapter will help BART staff determine the optimal amount and type of parking at each station.

2.2 | Fight bicycle theft

Building plentiful, secure bike parking will go a long way toward protecting BART passengers' bicycles. Adequate lighting in bicycle parking areas increases the security of passengers and their bicycles, while casting light on adjacent walkways, which benefits all passengers. Beyond these hardscape improvements, tracking theft data more closely, and encouraging passengers to report incidents of theft will help BART staff get a better handle on trends and hot spots.

Specific measures include improved reporting forms and databases, so that how and where stolen bikes were locked can be tracked; regular review of security videos; and better communication between BART police, bicycle planning staff and BART's Bicycle Accessibility Task Force. These recommended actions will help BART target sting operations, parking investments, safety campaigns and other theft prevention efforts. Educating riders on proper locking technique and recording and storing their bicycle's serial number will also help fight bicycle theft.

Bicycle parking that passengers can depend on to be available, secure and sheltered from weather, is arguably the most effective way to increase bike access to BART.

2.3 | Maintain bicycle facilities more frequently

Bicycle parking facilities don't engender confidence if they're populated with vandalized bikes or are otherwise in poor repair. As a complement to Strategy 2.1, BART should immediately remove clearly vandalized bikes and regularly maintain bicycle parking facilities, both those indoors and those exposed to the elements. This effort will communicate to passengers, as well as thieves, that BART is paying attention to theft. Frequent removal—at least quarterly—will also maximize available bicycle parking at each station. A corollary to this strategy is to identify which "abandoned" locks were intentionally left by regular BART passengers in order to avoid carrying these heavy items home at night, then back in the morning. This practice should be discouraged by BART, as these locks are a sign of bike theft to other passengers.

2.4 | Expand bicycle parking payment options

At present, passengers must obtain a BikeLink card online in order to use eLockers and automated bike stations. Retrofitting these electronic devices to accept Clipper card payment—which can be obtained at retail outlets and with cash—would remove one barrier to parking a bike at BART, while making bicycle access more inviting to passengers who may consider trying this mode. The first step toward implementing this strategy is to assess the feasibility and compatibility of Clipper card payment with existing and future bike

parking, and to develop a retrofitting program and timeline. Until paid bicycle parking at BART can accommodate Clipper cards, BikeLink cards should be made available in retail outlets and information on BikeLink should be published in multiple languages.

3 Beyond BART Boundaries

3.1 | Evaluate and implement bicycle sharing at BART stations

More than 50% of respondents to the 2011 BART passenger online survey cited needing or wanting a bike at their destination as a reason for bringing their bike onboard (see Appendix A). Bicycle-sharing is a system of short-term automated bicycle rental stations at which users can rent a bike and return it to another bike share location. This arrangement—which is especially well-suited to expand the reach of public transit systems—is underway in many cities throughout the world, and is coming to the Bay Area in spring 2013, including near all downtown San Francisco BART stations. Bike sharing can appeal to passengers, whose destinations may be just beyond walking distance of a station, as well as to those who want to experiment with biking to or from BART. Bike sharing eliminates the challenges of moving vertically through stations and boarding trains with a bicycle. BART should collaborate with local agencies and private partners to evaluate the new bike sharing system, with an eye towards expanding elsewhere in the BART system.

Bike-sharing is especially well-suited to expand the reach of public transit systems and is coming to the Bay Area in spring 2013.

3.2 | Support local efforts to improve bicycle access to stations

Without safe bikeways, clear wayfinding signage and adequate safe parking, no level of bicycle-related improvements BART makes will significantly increase the number of passengers who bike to BART stations. This perspective is increasingly recognized at the local, countywide and regional levels, most notably through the OneBayArea effort. BART Planning and Community & Government Relations staff should continue to ensure that BART is at the table developing such programs, particularly those aimed at

reducing driving to stations. Although BART does not have control over improvements outside of BART property, adequate Customer Access staff should be deployed to support local agencies in their efforts to fund and implement bicycle facilities near BART stations with letters of support and participation in local meetings. Funding a wayfinding sign program that produces and distributes to local governments unique signs that direct passengers with bicycles (and those without) to stations would help riders find preferred bicycle routes, and publicize the bike access option. Working with private developers to incorporate bicycle facilities into adjacent and nearby development will be an increasingly important way to improve bicycle access to BART stations. Another opportunity is the East Bay Greenway, a planned bicycle and pedestrian trail that will link five BART stations in Alameda County (see Goal & Strategies chapter). Appendix G provides a list of many other projects included in local plans, while Appendix D contains additional improvements suggested by countywide advocacy groups and bicycle/pedestrian advisory committee members.

3.3 | Create station area maps with recommended bike routes

For BART passengers unfamiliar with bikeways from their destination station to the nearby bicycle network, major destinations and bicycle shops, as well as potential passengers who now avoid BART because their destinations are beyond walking distance of a station, maps of station areas that show local bicycle route information up to a radius of three mile or so would increase ridership and bike access rates. BART should work with MTC staff to assure consistent route recommendations with MTC's BikeMapper online tool. This information should be posted on all station area and destination maps, as well as printed on pocket-sized bicycle-specific maps to be distributed at stations and bike shops and posted on the agency website. The reverse side should include information on BART bicycle programs and policies (see Strategies 5.1 and 5.2).

4 Bikes on BART

4.1 | Provide space for bicycles in new BART cars

Although this plan recommends that BART do all it can to encourage passengers who don't need their bicycle at the destination end of their trip to feel confident parking at their origin or destination station, there will always be passengers who need to take their bicycle onboard. Bicycle-priority areas on trains communicate that cyclists are welcome, while preventing bicycles from interfering with other passengers. In an ongoing effort to create more Bike Spaces, BART is removing seats from the current fleet of train cars. The cars scheduled for service in 2017 will each have changeable message signs, which should be programmed to indicate when a car contains a dedicated Bike Space. BART should also continue to refine the design of the Bike Spaces, folding seats and stabilizing features on these cars and consider special bicycle-priority cars with more of these features than other cars.

Bicycle-priority areas on trains communicate that cyclists are welcome, while preventing bicycles from interfering with other passengers.

4.2 | Evaluate blackout periods

In the 2011 BART passenger online survey, more than 50% of respondents cited needing or wanting a bicycle at their destination as a reason for bringing their bike onboard. However, due to crowding, passengers are not permitted to bring their bicycles aboard trains during the commute period in the commute direction¹⁷. Although together better bicycle parking (Recommendation 2.1) and bicycle sharing (Recommendation 3.1) will reduce the number of passengers who need to bring their bikes onboard, some passengers will always want this ability. To better accommodate these passengers, the agency should conduct a trial to lift the blackout period and

objectively evaluate the impacts. Regardless of the study outcome, BART should also consider lifting the blackout period entirely on select segments of the system that can accommodate bicycles during commute hours, such as Dublin/Pleasanton to Bay Fair.



If, after experimenting with lifting the blackout periods, BART chooses to continue to enforce them, the agency should consider standardizing the times during which bicycles are banned on trains. While today, the times are designated on a train-by-train basis, and therefore vary by station and are difficult for cyclists, train operators, station agents, BART police and other passengers to remember and understand, consistent, systemwide blackout periods, as are in effect at many other transit agencies, would make it easier to know when bicycles are allowed on BART; however, this standardization would reduce onboard bike access at any given station. BART should evaluate the blackout periods station-by-station to determine if there is a way to make the hours more consistent without significantly reducing onboard access. Regardless of if this exercise results in adjusted periods, clearly communicating blackout times will make trip planning easier for cyclists and enforcement easier for BART staff, while reducing potential conflicts during blackout periods.

¹⁷ In the off-peak period, when bicycles are allowed on trains, BART minimizes the number of cars on each train. Although this can result in crowded trains, this decision reflects the high cost of operating additional cars in terms of wear and tear on all vehicles in operation.

5 Persuasive Programs

5.1 | Educate passengers and staff on use and benefits of bicycles

One of the easiest barriers to overcome to increase bicycle access to BART is ignorance. Many passengers just don't know the best bike routes to their station, where and how to safely lock a bike or the rules surrounding bringing a bicycle onboard trains. Educating passengers on the use of BART's bicycle facilities can increase bicycle access, cyclist confidence and bike security in a number of ways. A public information campaign on how "bikes benefit everyone" can attract new cyclists and send a positive message to all BART passengers about bicycling. A targeted healthy station access program, perhaps partnering with Kaiser Permanente and/or countywide bicycle coalitions, could help promote the health benefits of riding to BART. A separate campaign to encourage BART staff to access BART by bike will give the system first-hand insight into how to improve bicycle access to BART.

5.2 | Improve communications with customers on BART bicycle policies and facilities

The ways in which messages about bicycle access are communicated are often as important as the messages themselves. Therefore, it is recommended that BART focus on this critical aspect of Strategy 5.1 as a separate strategy. Using positive language, posting information at appropriate decision-making points, and communicating all BART policies that affect bicycles through multiple media, including a smartphone app for bicycle education, information and updates, will make it easier for all passengers to learn and follow the rules. Public way-finding information, bicycle parking instructions, and bicycle rules should be printed in multiple languages and use international symbols whenever possible.

Ironically, one of the biggest determiners of bicycle access rates at a given BART station is the availability of free auto parking at that station.

5.3 | Create bicycle program in BART Capital Improvement Plan

Including a bicycle program in BART's Capital Improvement Plan will ensure funding to implement many of the recommendations in this Plan, such as bicycle parking, wayfinding infrastructure, stair channels and other capital-related strategies.

5.4 | Collect access mode data before/after bicycle improvements

One way in which bicycle access to BART is at a competitive disadvantage compared to other modes, particularly the automobile, is the shortage of information correlating bike-related investments to increased bicycle access and ridership figures. Better collection of bike access data before and after bicycle parking and other related improvements, and including more bike-related questions in systemwide surveys will put these sorts of investments on a more equal footing with other station improvements. Building the evaluation component of investments into the planned capital expenditure is another good way to guarantee funding for before/after assessments. Conducting the Station Profile Study more frequently than once per decade will also generate robust data with which to track investment performance and guide future investments. Coordinating with MTC's annual intersection count program to obtain access counts at specific stations is another potential source of useful data.

5.5 | Increase automobile parking fees

Ironically, one of the biggest determiners of bicycle access rates at a given BART station is the availability of free auto parking at that station (see Existing Conditions chapter for evidence of the strong relationship between parking fees and bike access). Charging market-rate parking fees at all BART stations, while providing excellent bike parking options, would likely allow BART to achieve the goal of doubling bicycle access by 2022 faster than any other strategy. Targeting a portion of the increased revenue to bicycle access improvements and evaluation is one logical source of revenue to pay for them. Related, in the process of constructing new development on BART parking lots, the agency should

evaluate how much lost automobile parking could be replaced with bicycle parking.



5.6 | Participate in more Bike-to-Work day events

For many commutes, combining bicycling and BART creates the best competition to driving to work. BART currently provides space at some stations for annual Bike-to-Work day events, but it is recommended that the agency more actively participate by staffing booths and providing special incentives to try regularly biking to BART.

Next Steps

The 20 recommendations in this chapter have the power to transform BART from a transit system that accommodates bicycles to one that depends on them. They are recommended based on their importance to a bike-friendly system, effectiveness in attracting new cyclists, ease of implementation, cost and benefits to other passengers. Taken together, they form the core of the first phase of doubling bicycle access to BART.

The second phase will follow this plan with annual implementation objectives to ensure that recommended strategies are pursued systemwide and at specific stations as needed. Since the planning context can change rapidly, BART will need to coordinate planned bicycle improvements with upcoming capital projects, grant opportunities, and staff from Police, Transportation Planning, Marketing and Research, and Operations departments, as well as seek direction from the bicycle investment tool and the BART Board.

For all strategies, BART will need to continue, and expand, the commitment of funding and staff to

improving bicycle access. Approaches to systemwide improvements will differ from those that focus on station-specific enhancements.

Systemwide Bicycle Access Coordination

Systemwide recommendations include policies regarding blackout periods, train car design and public campaigns to make the system more welcoming to cyclists. Some, but not all, of these strategies are part of larger, more comprehensive programs, such as wayfinding signage and rail car design. The BART Bicycle Accessibility Task Force (BBATF) is a volunteer committee of BART customers who meet regularly with BART staff with a mutual goal of improving bicycle access to the system and its stations. The Task Force will have valuable input on many, if not all, systemwide strategies recommended in this plan. Many systemwide recommendations may also require the collaboration of staff from BART Police, Transportation Planning, Marketing and Research, and Operations departments.

Station-specific Investments

Many strategies recommended in this chapter will make sense only at certain stations, either because they've already been implemented at some or because other investments would be more valuable in a particular station context. To determine the best use of staff time in terms of focusing on the strategies that will encourage the most new bicycle access at a given station, BART staff must use their judgment and the Bicycle Investment Tool to develop ideal station-by-station investment plans that consider the unique needs of and opportunities at each. This exercise will reveal instances where it may make sense to coordinate with other BART efforts and between departments, as well as with investments that would be best implemented at multiple stations simultaneously.

Funding

Although BART funds can be used for some recommended strategies, many will need support from outside sources. Appendix J provides a checklist of potential local, regional, state and federal funding programs and the type of projects each typically supports. Grants from outside sources can fund a variety of capital improvements, including the

elimination of hazards, traffic control devices, and bike lanes and paths within or beyond BART boundaries. In addition, as suggested in Strategy 3.2, BART staff can help local efforts to improve the bikeways that serve BART stations by writing letters and speaking at important public meetings.

Bicycle Investment Tool Updates

The Bicycle Investment Tool developed in conjunction with this bicycle plan is one of the first attempts anywhere to estimate and predict the effect of various strategies on bicycle access to transit. Due to limitations on the quantity and quality of data available for model development, there is much room for improvement to this pioneering effort (see Strategy 5.4). BART (and other transit operators) can improve the future performance of the tool through the following data collection efforts:

- **Survey data:** Future versions of the tool would benefit from more detailed bicycle-related data from the BART Station Profile and Customer Satisfaction surveys, including increasing the sample size, adding more bicycle related questions such as the ones included in the 2011 online BART Bicycle Access Survey, and augmenting existing survey questions by adding more bike-related response options.
- **Observed use data:** Detailed collection of bicycle infrastructure data at each station, including levels of use, would also add to the reservoir of information on which an improved spreadsheet tool will rely.

Appendices

A | Online Survey and Responses

This appendix provides a questionnaire and results of a survey distributed to the general population of BART passengers and to a much larger sample of self-described bicyclists in 2011.

Total Surveys* **4374**

1. Why do you typically ride BART?	Number of responses	% of responses
Commuting to/from work	2,662	61%
Visit friends/family	635	15%
Other	394	9%
School	173	4%
Theater or Concert	124	3%
Shopping	108	2%
Airplane trip	93	2%
Sports event	66	2%
Restaurant	35	1%
Medical/Dental	29	1%
Did Not Answer or Blank	55	1%

2. At what BART station do you typically enter at the beginning of your trips (home station)?	Number of responses	% of responses
MacArthur (Oakland)	329	8%
North Berkeley	251	6%
Ashby (Berkeley)	243	6%
Civic Center/UN Plaza (SF)	226	5%
24th St. Mission (SF)	224	5%
Rockridge (Oakland)	195	4%
16th St. Mission (SF)	184	4%
Downtown Berkeley	182	4%
19th St. Oakland	180	4%
El Cerrito Plaza	172	4%
Fruitvale (Oakland)	157	4%
Lake Merritt (Oakland)	152	3%
West Oakland	151	3%
Embarcadero (SF)	143	3%
Pleasant Hill/Contra Costa Centre	127	3%
Fremont	124	3%
El Cerrito Del Norte	95	2%
Millbrae	91	2%
Dublin/Pleasanton	85	2%

2. At what BART station do you typically enter at the beginning of your trips (home station)?	Number of responses	% of responses
Walnut Creek	84	2%
Glen Park (SF)	79	2%
12th St. Oakland City Center	71	2%
Concord	62	1%
San Leandro	61	1%
Powell St. (SF)	58	1%
Montgomery St. (SF)	53	1%
Bay Fair (San Leandro)	47	1%
Daly City	46	1%
Lafayette	46	1%
Pittsburg/Bay Point	45	1%
Union City	45	1%
Balboa Park (SF)	44	1%
Castro Valley	36	1%
Orinda	31	1%
North Concord/Martinez	30	1%
Coliseum/Oakland Airport	29	1%
Richmond	27	1%
Hayward	25	1%
West Dublin/Pleasanton	25	1%
South Hayward	22	1%
South San Francisco	21	0%
Colma	12	0%
San Bruno	10	0%
San Francisco Int'l Airport	3	0%
Did Not Answer or Blank	51	1%

3. At what BART station do you typically exit for these trips (destination station)?	Number of responses	% of responses
Embarcadero (SF)	742	17%
Montgomery St. (SF)	512	12%
Civic Center/UN Plaza (SF)	421	10%
Downtown Berkeley	297	7%
Powell St. (SF)	289	7%
16th St. Mission (SF)	250	6%
12th St. Oakland City Center	224	5%
19th St. Oakland	204	5%
Ashby (Berkeley)	110	3%
24th St. Mission (SF)	106	2%
MacArthur (Oakland)	102	2%

3. At what BART station do you typically exit for these trips (destination station)?	Number of responses	% of responses
San Francisco Int'l Airport	74	2%
Lake Merritt (Oakland)	67	2%
Millbrae	67	2%
Rockridge (Oakland)	66	2%
Coliseum/Oakland Airport	61	1%
Daly City	59	1%
North Berkeley	46	1%
Walnut Creek	43	1%
Balboa Park (SF)	42	1%
West Oakland	41	1%
Fremont	38	1%
Dublin/Pleasanton	36	1%
El Cerrito Plaza	33	1%
Pleasant Hill/Contra Costa Centre	31	1%
Fruitvale (Oakland)	30	1%
Richmond	30	1%
Glen Park (SF)	29	1%
Hayward	23	1%
Union City	22	1%
El Cerrito Del Norte	20	0%
Concord	19	0%
Lafayette	19	0%
San Leandro	19	0%
Orinda	15	0%
Bay Fair (San Leandro)	14	0%
South Hayward	13	0%
West Dublin/Pleasanton	10	0%
San Bruno	9	0%
South San Francisco	8	0%
Castro Valley	7	0%
Pittsburg/Bay Point	6	0%
Colma	3	0%
North Concord/Martinez	3	0%
Did Not Answer or Blank	114	3%

4. How far is it from your home to the BART station you typically use at the beginning of your trips?	Number of responses	% of responses
Between one and three miles	1,789	41%
One mile or less	1,609	37%
Greater than three miles	907	21%
Did Not Answer or Blank	69	2%

5. At what time do you typically enter the BART fare gates at the beginning of your trips?	Number of responses	% of responses
7:00-9:00am	2,031	46%
After 9:00am	1,714	39%
Before 7:00am	542	12%
Did Not Answer or Blank	87	2%

6. How do you typically get to your home BART station?	Number of responses	% of responses
Bike	2,166	50%
Walk all the way to BART	886	20%
Drive or carpool	803	18%
Public transit	317	7%
Dropped off	84	2%
Other	59	1%
Did Not Answer or Blank	59	1%

7. What level of bicyclist do you consider yourself to be?	Number of responses	% of responses
Advanced	1,563	36%
Intermediate	1,411	32%
Beginner	193	4%
Did Not Answer or Blank	1,207	28%

8. Why do you bike to BART (please check all that apply).	Number of checks
Most convenient travel option	2,292
Healthy/for exercise	2,192
Good for environment	2,024
Don't own a vehicle/don't drive	973
Difficult to find parking	817
Convenient/safe bike parking	603
Parking too expensive	577
Other	317
Did Not Answer or Blank	N/A

9. Do you typically park your bike at the BART station or do you bring your bike onboard?	Number of responses	% of responses
Bring bicycle onboard train	1,720	39%
Park bicycle at station	787	18%
It varies. Please explain:	684	16%
Did Not Answer or Blank	1,183	27%

10. What are the reasons you bring your bike onboard (check all that apply)	Number of checks
Need or want bike on other end	2,205
Don't feel safe leaving bike at station all day	1,154
Will not be returning to the station at which I first boarded	611
Other	139
Did Not Answer or Blank	N/A

11. Rate bike routes on city streets and/or pathways to/from station	Number of responses	% of responses
Good	1,280	29%
Adequate	1,159	26%
Poor	347	8%
Outstanding	261	6%
Did Not Answer or Blank	1,327	30%

12. Bike parking supply (amount) at your station	Number of responses	% of responses
Adequate	1,023	23%
Good	870	20%
Poor	744	17%
Outstanding	331	8%
Did Not Answer or Blank	1,406	32%

13. Bike parking location at your station	Number of responses	% of responses
Good	1,056	24%
Adequate	821	19%
Poor	601	14%
Outstanding	485	11%
Did Not Answer or Blank	1,411	32%

14. Presence of attended bike parking (i.e. bike station at Downtown Berkeley or Fruitvale stations)	Number of responses	% of responses
Not Applicable (no attended bike parking)	2,194	50%
Outstanding	248	6%
Good	230	5%
Poor	162	4%
Adequate	153	3%
Did Not Answer or Blank	1,387	32%

15. Lighting around bike parking at your station	Number of responses	% of responses
Adequate	1,227	28%
Good	1,012	23%
Poor	469	11%
Outstanding	222	5%
Did Not Answer or Blank	1,444	33%

16. Security of bike parking at your station	Number of responses	% of responses
Poor	1,152	26%
Adequate	882	20%
Good	613	14%
Outstanding	275	6%
Did Not Answer or Blank	1,452	33%

17. Signs to locate bike parking at your station	Number of responses	% of responses
Adequate	823	19%
Poor	744	17%
Good	681	16%
Not Applicable (none at my station)	544	12%
Outstanding	115	3%
Did Not Answer or Blank	1,467	34%

18. Getting bike from street level to bike parking	Number of responses	% of responses
Parking is on street level	911	21%
Adequate	654	15%
Good	577	13%
Poor	486	11%
Outstanding	313	7%
Did Not Answer or Blank	1,433	33%

19. Getting bike from street level to platform	Number of responses	% of responses
Adequate	1,269	29%
Poor	930	21%
Good	481	11%
Not Applicable	265	6%
Outstanding	55	1%
Did Not Answer or Blank	1,374	31%

20. In your opinion, should bikes be allowed on escalators?	Number of responses	% of responses
Yes, when lack of crowding permits it	1,403	32%
Yes, at all times	815	19%
Never, consistent with the current rules	421	10%
Yes, during off-peak periods	397	9%
Did Not Answer or Blank	1,338	31%

21. Are you familiar with the "stairway channel" at the 16th Street BART station?	Number of responses	% of responses
Yes	1,594	36%
No	1,460	33%
Did Not Answer or Blank	1,320	30%

22. Have you ever used the stairway channel at 16th Street to wheel your bicycle up or down the stairs?	Number of responses	% of responses
Yes	1,108	25%
No	487	11%
Did Not Answer or Blank	2,779	64%

23. What do you find to be the most convenient and easiest way to transport your bicycle between levels at the 16th Street BART station?	Number of responses	% of responses
Use the stairway channels	490	11%
Carry it on the stairs	477	11%
Use the elevator	94	2%
I don't use the 16th Street BART station	0	0%
Did Not Answer or Blank	3,313	76%

24. Which type of bicycle parking do you prefer? Please rank the types (lower is better)	Ranking
Attended bike station (such as Downtown Berkeley and Fruitvale)	2.26
BikeLink electronic lockers (shared use)	2.64
Bike racks inside the paid area	2.86
Self-serve bike station (such as Embarcadero and Ashby)	2.87
Keyed bicycle lockers (personal locker)	3.53
Bike racks outside the paid area	4.68
Did Not Answer or Blank	N/A

25. Are you familiar with electronic lockers/BikeLink?	Number of responses	% of responses
Yes	1,620	37%
No	1,089	25%
Did Not Answer or Blank	1,665	38%

26. Do you ever use electronic lockers/BikeLink?	Number of responses	% of responses
No	1,772	41%
Yes	927	21%
Did Not Answer or Blank	1,675	38%

27. How easy or difficult do you find using electronic/BikeLink lockers?	Number of responses	% of responses
Extremely easy	471	11%
Moderately easy	378	9%
Somewhat difficult	69	2%
Very challenging	17	0%
Did Not Answer or Blank	3,439	79%

28. How possible is it for you to get to BART by bicycle?	Number of responses	% of responses
Very possible	390	9%
Not possible	264	6%
Somewhat possible	157	4%
Slightly possible	124	3%
Did Not Answer or Blank	3,439	79%

29. Please indicate how much each factor prevents you from bicycling to BART.	Ranking
Not enough space for bikes on train cars (no bike racks, crowds)	5.42
The ban on bringing bikes aboard trains in peak-period/direction	5.39
Poor weather	4.57
Don't own a bicycle	4.34
Lack of secured/covered/lighted parking	4.20
Lack of bike lanes or paths on my route to BART	4.19
Difficulty getting bike through station	4.08
Too far between home and station	4.05
Poor road conditions (potholes, unsafe streets)	3.93
Don't feel comfortable riding a bicycle	3.71
No changing rooms/showers at work	3.70
Not enough bike parking	3.69
Need to run errands before/after work	3.59
Too many hills	3.38
Lack of signage showing where bike parking is, where elevators are, etc.	3.17
Inconvenient location of bike parking	3.04
Dangerous car parking configurations/driveways	2.94
Need to pick up/drop off children	2.19
Don't know how to ride a bicycle	1.81
Did Not Answer or Blank	N/A

30. Which one factor from the list above presents the most significant obstacle?	Number of responses	% of responses
Don't own a bicycle	176	4%
Too far between home and station	150	3%
The ban on bringing bikes aboard trains in peak-period/direction	143	3%
Don't feel comfortable riding a bicycle	98	2%
Lack of secured/ covered/lighted parking	60	1%
Not enough space for bikes on train cars (no bike racks, crowds)	54	1%
Too many hills	41	1%
Poor road conditions (potholes, unsafe streets)	36	1%
Not enough bike parking	28	1%
Need to pick up/drop off children	25	1%
Lack of bike lanes or paths on my route to BART	23	1%
Need to run errands before/ after work	22	1%
Difficulty getting bike through station	21	0%
No changing rooms/showers at work	21	0%
Poor weather	14	0%
Dangerous car parking configurations/ driveways	5	0%
Lack of signage showing where bike parking is, where elevators are, etc.	3	0%
Inconvenient location of bike parking	2	0%
Did Not Answer or Blank	3,452	79%

31. Which of the following would make it more likely you would bike to BART?	Ranking
Ability to bring bikes on trains at all times	7.88
Protected pathways and bike lanes leading to BART stations	6.74
More secured/covered bike parking (bike stations, electronic lockers)	6.47
Easier bike access through stations (wider fare gates, stairway channels, etc.)	6.09
More conveniently located bike parking (near station agents/fare gates for visibility and security)	5.88
More bike parking	5.17
Shared bikes available for rent at stations	4.52
More in-station amenities (groceries, errands) to reduce need to travel long distances for essentials	3.90
Increased car parking fees at stations to reduce attractiveness of driving to station	3.83
A program to try folding bikes or purchase at discount	3.71
Did Not Answer or Blank	N/A

32. What is your age?	Number of responses	% of responses
25-34	1,272	29%
55-64	433	10%
18-24	263	6%
65 and older	107	2%
13-17	13	0%
12 or younger	0	0%
35-44	0	0%
45-54	0	0%
Did Not Answer or Blank	2,286	52%

33. What is your gender?	Number of responses	% of responses
Male	1,957	45%
Female	1,560	36%
Other	37	1%
Did Not Answer or Blank	820	19%

34. What is your annual household income?	Number of responses	% of responses
\$100,000 - \$149,999	658	15%
\$50,000 - \$74,999	638	15%
\$25,000 - \$49,999	598	14%
\$75,000 - \$99,999	574	13%
\$150,000 - \$199,999	320	7%
Under \$15,000	214	5%
\$15,000 - \$24,999	206	5%
\$200,000 - and over	0	0%
Did Not Answer or Blank	1,166	27%

* Simple frequency results from combined open (primarily cyclists) and invitation (general BART riders) surveys. For a breakdown of responses by primarily cyclist riders and general BART riders, see <http://www.bart.gov/news/articles/2011/news20110901.aspx>.

B | Bike Station Survey and Responses

On the following pages is the survey administered to users of BART's two attended bike stations, followed by the survey responses.



Please take a few minutes to complete this survey about your use of the Bike Station. Return your completed survey to the box by the attendant. Thanks.

1) When did you first start using the Bike Station to park your bike?

- ☐ Within the past month
- ☐ 1-6 months ago
- ☐ More than 6 months ago

2) How many days per week do you currently leave your bike at the Bike Station?

- ☐ 6-7 days per week
- ☐ 5 days per week
- ☐ 3-4 days per week
- ☐ 1-2 day per week
- ☐ 1-3 days per month
- ☐ Less than once per month

3) How often do you leave your bike overnight at the Bike Station?

- ☐ 6-7 days per week
- ☐ 5 days per week
- ☐ 3-4 days per week
- ☐ 1-2 day per week
- ☐ 1-3 days per month
- ☐ Less than once per month
- ☐ Never

4) When you leave your bike at the Bike Station, where are you normally going? (check one)

- ☐ Home
- ☐ Work
- ☐ School
- ☐ Medical/Dental
- ☐ Shopping
- ☐ Airport
- ☐ Sports Event
- ☐ Restaurant
- ☐ Theater or Concert
- ☐ Visit friend(s)
- ☐ Other: _____

5) Do you normally use BART in combination with your use of the Bike Station?

- ☐ No
- ☐ Yes

6) If the Bike Station was not available for you to park your bike, which of the following would you most likely do? (check one)

- ☐ Ride your bike to the same area but park elsewhere
- ☐ Ride your bike and take it on BART rather than parking
- ☐ Ride your bike all the way to your destination
- ☐ Ride to a different BART station
- ☐ Not ride your bike at all
- ☐ Not ride your bike as often
- ☐ Other: _____



7) Did the option to park at the Bike Station . . . (check one)

- ☐ make it more likely you would ride your bike for this trip
☐ not change the likelihood of using your bike for this trip

8) In general, how satisfied are you with the service provided by the Bike Station?

- ☐ Very satisfied ☐ Somewhat dissatisfied
☐ Somewhat satisfied ☐ Very dissatisfied
☐ Neutral

Why is that?: _____

9) Are you familiar with the BikeLink Card?

- ☐ No
☐ Yes



If yes, do you have a BikeLink Card?

- ☐ Yes
☐ No

10) Your home ZIP Code: _____**11) Your age**

- ☐ 12 or younger ☐ 35-44
☐ 13-17 ☐ 45-54
☐ 18-24 ☐ 55-64
☐ 25-34 ☐ 65+

12) Gender

- ☐ Female
☐ Male

13) Comments or suggestions for improving the Bike Station?

14) Can we contact you in the future to ask you opinion about the Bike Station or BART?

- ☐ No
☐ Yes



If yes, please provide you first name and an email address:

Name: _____

Email: _____@_____



Thanks for completing the survey and for riding your bike.



Bike Station Survey Responses

	Berkeley		Fruitvale		Combined	
1) When did you first start using the Bike Station to park your bike?						
Within the past month	3	5%	7	8%	10	7%
1-6 months ago	19	35%	11	13%	30	21%
More than 6 months ago	33	60%	70	80%	103	72%
	55	100%	88	100%	143	100%
2) How many days per week do you currently leave your bike at the Bike Station?						
6-7 days per week	1	2%	2	2%	3	2%
5 days per week	24	44%	36	41%	60	42%
3-4 days per week	18	33%	30	34%	48	34%
1-2 day per week	7	13%	10	11%	17	12%
1-3 days per month	5	9%	8	9%	13	9%
Less than once per month	0	0%	2	2%	2	1%
	55	100%	88	100%	143	100%
3) How often do you leave your bike overnight at the Bike Station?						
6-7 days per week	1	2%	0	0%	1	1%
5 days per week	0	0%	1	1%	1	1%
3-4 days per week	2	4%	2	2%	4	3%
1-2 day per week	1	2%	0	0%	1	1%
1-3 days per month	7	13%	15	17%	22	15%
Less than once per month	20	36%	27	31%	47	33%
Never	24	44%	43	49%	67	47%
	55	100%	88	100%	143	100%
4) When you leave your bike at the Bike Station, where are you normally going? (check one)						
Home	2	3%	5	6%	7	5%
Work	44	67%	69	80%	113	74%
School	4	6%	6	7%	10	7%
Medical/Dental	0	0%	1	1%	1	1%
Shopping	3	5%	0	0%	3	2%
Airport	0	0%	1	1%	1	1%
Sports Event	0	0%	0	0%	0	0%
Restaurant	3	5%	3	3%	6	4%
Theater or Concert	1	2%	0	0%	1	1%
Visit friend(s)	2	3%	0	0%	2	1%
Other: _____	7	11%	1	1%	8	5%
	66	100%	86	100%	152	100%

	Berkeley		Fruitvale		Combined	
5) Do you normally use BART in combination with your use of the Bike Station?						
No	15	27%	7	8%	22	15%
Yes	40	73%	81	92%	121	85%
	55	100%	88	100%	143	100%
6) If the Bike Station was not available for you to park your bike, which of the following would you most likely do? (check one)						
Ride your bike to the same area but park elsewhere	16	26%	15	17%	31	21%
Ride your bike and take it on BART rather than parking	8	13%	23	26%	31	21%
Ride your bike all the way to your destination	3	5%	4	5%	7	5%
Ride to a different BART station	6	10%	2	2%	8	5%
Not ride your bike at all	7	11%	21	24%	28	19%
Not ride your bike as often	11	18%	15	17%	26	17%
Other: _____	10	16%	8	9%	18	12%
	61	100%	88	100%	149	100%
7) Did the option to park at the Bike Station . . . (check one)						
make it more likely you would ride your bike for this trip	39	74%	77	93%	116	85%
not change the likelihood of using your bike for this trip	14	26%	6	7%	20	15%
	53	100%	83	100%	136	100%
8) In general, how satisfied are you with the service provided by the Bike Station?						
Very satisfied	54	100%	82	99%	136	99%
Somewhat satisfied	0	0%	1	1%	1	1%
Neutral	0	0%	0	0%	0	0%
Somewhat dissatisfied	0	0%	0	0%	0	0%
Very dissatisfied	0	0%	0	0%	0	0%
	54	100%	83	100%	137	100%
9) Are you familiar with the BikeLink Card?						
No	17	32%	68	82%	85	63%
Yes	36	68%	15	18%	51	38%
	53	100%	83	100%	136	100%
If yes, do you have a BikeLink Card?						
Yes	19	51%	5	36%	24	47%
No	18	49%	9	64%	27	53%
	37	100%	14	100%	51	100%

Berkeley

Fruitvale

Combined

10) Your home ZIP Code:**11) Your age**

12 or younger	0	0%	0	0%	0	0%
13-17	1	2%	4	5%	5	4%
18-24	6	11%	5	6%	11	8%
25-34	22	41%	17	20%	39	28%
35-44	7	13%	26	31%	33	24%
45-54	9	17%	19	23%	28	20%
55-64	7	13%	10	12%	17	12%
65+	2	4%	2	2%	4	3%
	54	100%	83	100%	137	100%

12) Gender

Female	27	52%	26	33%	53	40%
Male	25	48%	53	67%	78	60%
	52	100%	79	100%	131	100%

C | Summary of Focused Group Discussions

In May 2011, four focused group discussions—with a total of 40 participants—were conducted with BART passengers who bicycle for other trips, but who, for the most part, currently drive to BART. Responses are reported in this appendix in four sections, listed below. (Numbers indicate number of participants who made each comment. No number indicates one comment.)

- Challenges to bicycling to BART and suggested solutions
- Preference for short term or long term bicycle parking
- Preference for onboard bicycle accommodation
- Anticipated effectiveness of various strategies at increasing rate of bicycle access to BART

Challenges to bicycling to BART and suggested solutions

Challenge	Solution
On-site	
Security/Theft	
<ul style="list-style-type: none"> • Security problems/thefts at Millbrae/Bayfair/Lake Merritt Stations, now nervous to bring a bike and usually drive • Coliseum Station very dangerous, location of bike parking not safe...73rd Ave is a very dangerous access street (5) • Fear of theft at stations results in either bringing bike on board or not biking at all (don't need it on other end but take bike anyway for fear of theft)...don't want to leave bike outside in open racks (6) • Leaving bike in a rack, especially when other bikes are noticeably damaged, does not create peace of mind (4) 	<ul style="list-style-type: none"> • Bayfair Station needs security cameras to protect stored bikes • Better lighting and location/visibility of bike parking could help aid in safety (police not enough) (4) • Bike parking at Coliseum station should be located near employee parking • Lafayette has great bike racks, but in an unsupervised location • More police protection needed at bike lockers/racks... cameras not enough • Protected BikeStations good for peace of mind
Burdensome to Get Bike Through Station	
<ul style="list-style-type: none"> • Carrying bike up/down stairs not easy (can't bring bike on escalators) (7) • Stairways very narrow for a bike, especially when crowded • Big logistical issue of going through elevator and then having to go back to pay fare • Elevators at stations very narrow and often not working, can't bring 2 bikes on them at once (2) • Narrow faregates difficult to get bike through 	<ul style="list-style-type: none"> • Need stairway channels (4) • Wide faregates work well to accommodate bikes • Some stations (North Berkeley, Walnut Creek) have a faregate near elevator so you don't have to go back out to pay • Bikes should NOT be on escalators during peak times because it's not respectful, too large...but if it's not peak hours then people should be able to • Maintained elevators/wide elevators (Dublin/Pleasanton a good example) (4) • Cyclists bringing bikes up stairs can be disruptive, need signs to alert all passengers to stay on the right • Signs in station to inform of proper bike etiquette (4)
Bike Parking/Storage	
<ul style="list-style-type: none"> • Not enough bike parking in downtown SF stations...would 	<ul style="list-style-type: none"> • BikeLink parking is excellent, very cheap and secure,

Challenge

- be nice if office buildings had more parking
- Not enough information on where to park bikes/how storage works...need more signage (4)
- Fruitvale BikeStation closes at 8pm and not open on weekends
- Lockers always full (Concord/MacArthur Stations)
- Very fact that you have to be on a wait-list for a locker is an incentive to NOT let it go, whether it is used or not

Solution

- need more (Lake Merritt Station) (3)
- Need covered bike parking for rain and heat protection
- More parking needed at end-destination stations, such as downtown Oakland and San Francisco stations
- Need to be able to use Clipper on BikeLink/eLockers
- BikeStation in Fruitvale excellent, should be model for other stations (4)
- Bike-share programs
- eLockers should have number of spaces available online, like car parking (knowing a bike parking spot is available would be a deterrent from driving and aid in flexibility)
- Better signage alerting rider of where bike parking is located, perhaps near elevators and faregates (Civic Center Station cited as example of where this is needed)
- More information on how to use eLockers

Automobile parking supply and fees

- Depending on time of day, driving/parking is more convenient at Fremont BART than biking
- To reach Fremont bike parking, need to mix with cars, risk getting cut off by taxis and ride through parking spaces reserved for disabled passengers in order to reach bike parking (2)
- Motivated to bike because auto parking lot is full
- Stations could have small stores for groceries/errands to avoid having to drive after work for daily tasks, and would bring more people to station for sense of security (3)
- Bike lanes through parking lot needed

Systemwide Policies/Train Car Issues**Time of Day/Rush Hour Ban**

- Limited by what train to ride (bike ban during rush hour)...always have to plan ahead, not a supportive system, especially for children (5)
- Rush hour limitation of bringing bike on board coupled with poor security at Bayfair Station means I drive
- Better PR lately about allowing bikes on trains...network with local bike groups (Easy Bay Bicycle Coalition) to get word out that bikes are welcome on BART
- Extend bike hours

Lack of Space on Cars/Crowds

- Passengers can be very rude toward bicyclists (4)
- Not enough space on trains in rush hour, don't want to burden other passengers...worried train will be full when only a four car train on Fremont-Richmond line (5)
- Need to stand a long time if bike is taken on-board, no special seating for bicyclists
- Intimidated to bring bike on board because of overall difficulty...belief that only hardcore cyclists bring bikes on BART
- Modifying work schedule to avoid rush hour ban not very practical because most have set work hours
- New train cars with pictures of where bikes are supposed to go ("Bike Space") are very helpful and show people that bikes belong...helps overcome non-bike passenger resistance towards bikes (3)
- Consistency in enforcement of bike rules by police, station agents, and train operators (example: train operators inconsistently enforce blackout periods, and have widely varying approaches to enforcing the first car prohibition)) (4)
- Both non-cyclists and cyclists need to understand the rules for bringing a bike on board (2)

Challenge

- 40-year-old train cars do not fit modern world's amount of stuff people bring on trains

Solution

- Since existing rules are rarely enforced, additional ones won't help
- Suggestion: total bike car at all times, nobody else (Caltrain a good example) (4)
- Disadvantage: still time limited, not knowing where first/last car are
- Advantage: community of cyclists
- Cyclists need to be more cognizant of how much space they are taking on the train (2)
- More seats should be taken out of train cars to allow for additional bike space, especially bike racks (also helpful for people with luggage and strollers/wheelchairs)
- More on-train information about what station you are at/approaching (NYC, Muni good examples)
- Butt-rails to lean on when standing/holding bike (common in France)
- Bike-only cars should be adjacent, not first and last, so if one car is full people, can access the other without running down the platform
- Bringing bike on weekends is fine because less crowding

Other Solutions

- Fare discount/incentives for bike riders
- Free bike experts at BART stations for repairs/questions
- Get rid of carpet on trains!

Off-site Access

Hills/Weather/Environmental Issues

- Hills mentioned as a barrier to access Bayfair, Castro Valley, Powell Stations by bike
- Would bike more but weather/things to carry an inhibitor (5)
- Messing up hair/clothes (no showers/facilities at work)
- Darkness at night a deterrent from riding, especially on access trails in more rural BART areas (Lafayette-Moraga Trail has animals at night)

City Streets

- Would bike more but distance between Livermore and Dublin/Pleasanton Station about 10 miles and no good path
- Bay Area streets not set up for bicyclists as compared with other areas (Seattle mentioned)...too many gaps in the biking network (Lafayette Station cited) (3)
- Potholes prevalent on city streets
- Walnut Creek Station very dangerous to bikes...cars
- Fremont Station needs bike lanes to access station
- Need more dedicated lanes on city streets leading to stations in areas not dominated by cars...Orinda/Dublin Stations are good examples, San Leandro/Bayfair need help
- 40th Street in Oakland a very busy road even with bike lane, so bike a circuitous route to Macarthur Station on less busy streets...most direct path not necessarily the

Challenge

- coming in all directions on arterial streets, bike paths inferior compared with Lafayette
- Transbay Terminal construction messing up streets in downtown SF, difficult to navigate street closures
- Fremont Station very difficult to access bike...need to ride through parking lot or through bus lanes/cab stand
- Destination is not walkable...biking is only option on other end
- Some bike paths (Clayton Rd) too narrow to ride (2)

Other Public Transit Concerns

- Not enough bike space on Muni buses (only 2 front racks)

Solution

- most bike-friendly
- BART shuttles with bike racks to bring passengers to stations (like Emery-Go-Round)

Preference for short term or long term bicycle parking

Participants were told: "Currently BART offers two general types of bike parking:

1. Bike racks usually near the station entrance and sometimes even in the paid area of the station. You bring your own lock, it's quick, it's pretty simple.
2. Bike lockers and bike stations (group parking facilities). To use these you need to purchase a Smartcard (BikeLink), check yourself in and out and pay approximately 3 cents per hour. A little more effort on your part but an extra level of security."

They were then asked which type they prefer and why:

- **Bike Racks:** 1 vote
Comments:
 - Nice to be able to get in/out quickly
- **Bike Lockers/stations:** 37 votes
- **No response:** 2 votes

Preference for onboard bicycle accommodation

Participants were told: "In a time of increasing ridership without peak period/peak direction capacity increases foreseen, BART is trying to find ways to better accommodate bikes onboard trains, while minimizing impacts on wheelchair users and other BART riders. How would you feel about a concept that would allow bicycles on the first and last car of every train only, but with these cars outfitted with bicycle racks that could accommodate multiple bikes comfortably versus continuing the current approach of

allowing bikes on every car but the first car, with some cars having some extra open space for wheelchairs, bikes, luggage, and strollers to share as needed?

- **Bikes on first/last car with racks:** 7 votes
Comments:
 - Still time limited
 - Could help foster a biking "community"
 - Fear of too much crowding on cars...who has priority?
 - Cars should be reserved only for bicyclists (3)
 - Could make it harder to share space with other passengers
 - Wouldn't funneling all cyclists into one or two cars extend dwell times?
- **Bikes on adjacent cars:** 12 votes (would prevent running through station to get to other end if one car is full)
- **Bikes on every car except the first, but with extra space:** 18 votes
Comments:
 - How would BART ensure there is space? Same problem today
 - Spreads bikes out rather than crowding into 2 cars
 - Should be section on each car for bikes
 - Want dedicated space but on every car
 - Could also help luggage and wheelchair users

Anticipated effectiveness of various strategies at increasing rate of bicycle access to BART

Strategy	Ranked choice		
	#1	#2	#3
More bike parking	1	4	5
More secure bike parking	18	8	7
Covered bike parking	1	3	5
More conveniently located bike parking	2	1	4
Protected bike lanes on city streets leading to BART stations	6	9	8
Increased car parking fees at station lots to reduce attractiveness of driving to station	2	0	1
More in-station amenities (groceries, errands) to reduce need to travel long distances for essentials	5	7	2
Ability to bring bikes on trains at all times	11	9	3

D | Summary of Advocate and BPAC Meetings

This appendix contains a list of suggested improvements to BART stations and station areas suggested by representatives of countywide bicycle advocacy groups and countywide Bicycle Advisory Committees throughout BART's service area. Combined with the improvements listed in Appendix G, Needed Station Area Improvements cited in published plans, Appendix D includes many but perhaps not all needed upgrades in the vicinity of BART stations.

Countywide advocacy group comments

East Bay Bicycle Coalition meetings, 5/27/11 and 6/1/11

Issues Specific to Contra Costa County BART Stations

Pittsburg/Bay Point

On-station/parking issues

- Difficult to get a bike through station to platform, have to go up stairs or two elevators, a major deterrent

Off-station access issues

- Need a bike signal, better signage, and safe crossing for bikes/pedestrians at intersection between station/Hwy 4 off-ramp/Bailey Rd/ Delta de Anza Trail
- Put a two-way bike trail along the north side of the station to connect to De Anza Trail and overcome the Bailey Road intersection
- Pittsburg has a bike lane planned on Bailey Rd, as well as a major redesign plan for Bailey
- Need bike lanes and sharrows on the 4-lane entrance-exit road to the Station from Bailey Road
- If bicycles are suggested to use the sidewalk instead, then the pinch point near the station should be widened
- Have buses stop 15 or 20 feet farther into the station area and leave the curb cut accessible to bikes
- It is excessive to add one more automobile entrance/exit to the station parking area along West Leland Road

North Concord

Off-station access issues

- Bike path along BART right-of-way/Port Chicago Highway

- An asphalt path along Panoramic Drive needs a curb cut (48' wide curb-to-curb street)
- Bike lanes need to be added to Panoramic Drive, the street in front of the Station.
- Finish the sidewalk and trail along the east side of Port Chicago Highway
- Need signage to and along Delta-de Anza trail bike route

Concord

On-station/parking issues

- Only station in system to have a cell phone-operated eLocker system but rarely used

Off-station access issues

- More signage needed to alert bicyclists of where routes are/where parking is at station

Pleasant Hill

On-station/parking issues

- Future bike garden/pavilion will be at south end of the station
- Some bike parking spaces were moved for station construction one week before Bike to Work Day...better communication needed

Off-station access issues

- Jones Road bridge of the Iron Horse Trail entry point to BART station needs more signs to alert drivers along Jones Rd of bicyclists...currently has different color crosswalk but more needed
- North entrance to station off Jones Rd/Iron Horse Trail has no treatment, bicyclists have to cross street and end up in bus lanes
- 10pm curfew on Iron Horse Trail by EBRPD an issue for night cyclists

- Treat Blvd overcrossing above I-680 not pedestrian/bike friendly...no bike lanes, problem with dense housing planned on other side of freeway
- Oak Road has no bike lanes
- Pleasant Hill BART Shortcut Path will cut off 3/4-1 mile to station...CCTA needs to step in and oversee project, in planning stages for 6 years (police and maintenance jurisdiction are big issues)
- The Canal Trail requires out-of-direction travel.

Other issues

- Closest station to Diablo Valley College (4 miles)
- Known as a theft-rich station

Walnut Creek

On-station/parking issues

- Anecdotally known as a theft-rich station
- Major TOD planned in existing parking lots

Off-station access issues

- Oakland/Hwy 24 off-ramp/Ygnacio Valley Road intersection (redesign project in 2001) a major problem for cyclists trying to cross from existing bike path (under BART right-of-way) into the station, where the bike parking currently exists
- Need to ride bikes in the opposite direction as buses or along sidewalk to get to station from YVR/N. California Blvd intersection station entrance; a safer route is needed.
- Ygnacio Valley Road very dangerous for cyclists trying to get to Iron Horse/Canal Trails
- Sidewalks with "Bikes May Use Sidewalk" signs should be increased to 10 feet wide.
- Need better connections to west side of I-680
- Sharrows or a lane needs to be added through the parking area
- Make wider, direction-specific curb-cuts at the intersections,
- Mitigate the limited-sight-distance intersection at the court parking lot.

Lafayette

On-station/parking issues

- More bike parking needed along the south side of the station, but be mindful of lighting/security issues of putting bike parking in desolate spaces
- Bike parking could also be put inside station fare gates but would require going up stairs
- Poorly built stairway channel (new)

Off-station access issues

- Wheelchair access being built, used by cyclists to get to Downtown Lafayette, needs a curb cut

- Bike lanes needed on Happy Valley but on-street car parking would need to be removed
- Mount Diablo Blvd now has a sharrow
- Deer Hill Road has a great bike signal, should be used as an example for other sites

Orinda

On-station/parking issues

- Large number of people on wait-list for lockers, but eLockers coming
- Stairway at northwest corner of station should be replaced with a ramp

Off-station access issues

- Camino Pablo undercrossing very dangerous for cyclists with blind corners and sightlines
- Improve signage from St. Stephens to station
- Improve sight lines on Camino Pablo undercrossing
- ADA ramp needed east of station to downtown Orinda
- Need bike lanes on Bryant Way for cyclists accessing St. Stephens trail, will require removing auto parking

Richmond

On-station/parking issues

- Major development slated for the east side of the station, similar to what has been done at the west side
- West side of station needs stair channels
- Good location for bike parking...near the station agent

Off-station access issues

- Bike lane project on Barrett Ave, as well as streetscape project for 23rd Street in the works
- Signage needed from station to bike route to Kaiser Hospital
- Connection problem from station to Richmond greenway

El Cerrito del Norte

Off-station access issues

- Four-way stops needed at Ohlone Greenway and Hill/Cutting intersections
- San Pablo/Cutting/Eastshore Blvd intersections very dangerous for bicyclists (and pedestrians)

El Cerrito Plaza

On-station/parking issues

- Reports of malfunctioning eLockers

Off-station access issues

- Intersections of Ohlone Greenway and Central/Fairmont need 4-way stops

- Overall a quality station for bike accessibility

Future Antioch eBART

Off-station access issues

- Station will require crossing Highway 4 on the Hillcrest Avenue overcrossing.
- Consider a pedestrian-bicycle bridge over the freeway east of the station to eliminate the need for crossing the on-ramp in question.

Issues Specific to Alameda County BART Stations

Rockridge

On-station/parking issues

- Possible plans for a Bike Station
- Should have a higher bike parking utilization, perhaps low because of poor locations of bike parking
- The only parking spot with high demand is at the bottom of the stairs on street level because it has the most eyes and perhaps is used by non-BART riders in neighborhood
- Add more lighting in front of elevator at ground level

Off-station access issues

- Cars drive very fast along College Ave under the freeway...very dark and unwelcoming for bikes, pedestrians, and car
- Bike lanes needed on Keith Ave
- Need signage to get to Webster/Shafter bike route from station

North Berkeley

On-station/parking issues

- Ramp to bike parking needs to be improved on the south side of the station
- Good station elevator...has its own fare gate
- Should open up the station dome to see through the station
- Bike theft known to be a problem
- Personal safety of bike lockers in unattended spaces at night

Off-station access issues

- Needs signs to station from Ohlone Greenway in Albany
- Four-way stop needed at Virginia and Sacramento intersection

Downtown Berkeley

On-station/parking issues

- Stairway channels needed
- Some parking at the north side of the station was removed and placed at Macarthur
- Need to promote BikeLink at station

Ashby

On-station/parking issues

- Great bike station design, but perhaps should be easier to see through more personal security (has a panic button)

Off-station access issues

- Bike access from Woolsey needs signage because Ed Roberts Campus now blocks station entrance
- No obvious way to get from station to Milvia bikeway, the main bike access route to downtown Berkeley

Macarthur

On-station/parking issues

- Transit Village now under construction
- Bike Station will be built with good design concepts

Off-station access issues

- Bike lanes needed on 40th/Macarthur/Martin Luther King/Telegraph

19th Street

On-station/parking issues

- Double-decker bike racks are excellent
- The elevator at street level has no sign and is very hidden...need a map of where it is in the station and on street
- Stairway channels needed

12th Street/Oakland City Center

On-station/parking issues

- Stair channels needed
- Talk of putting a Bike Station at City Center, but would it be better to put it at 19th Street Station? BART needs to be part of this conversation
- Parking currently at concourse level
- Office buildings have bike parking, but it is bad so most people park bikes at station

West Oakland

Off-station access issues

- Planned improvements on 7th Street near the station will improve bike access

- Clear bike access points

Lake Merritt

On-station/parking issues

- Stairway channels needed
- Has lots of bike parking but needs more eLockers (all occupied)

Off-station access issues

- Perhaps a counterflow bike lane on all the one-way streets?

Fruitvale

On-station/parking issues

- Has excellent bike parking

Off-station access issues

- Needs a clear path and curb cuts to get to 34th Avenue...all roads in the area leading east are challenging for bicyclists
- A two-way bikeway is needed between 33rd Avenue and San Leandro Blvd
- Fruitvale Avenue is the main route taken by all residents of Alameda to get to station

Coliseum/Oakland Airport

On-station/parking issues

- Bike parking on the east side of the station very uninviting

Off-station access issues

- Not known how to get to Hegenberger Rd, needs signage
- Need signage/routes to East Bay Greenway
- Personal safety inside station and on city streets leading to station a huge problem

San Leandro

Off-station access issues

- Verify that city improvements don't affect West Juana and Estudillo Avenues, which are major walk/bike routes to downtown
- Pedestrian crossing needed over railroad
- Opportunities for improved bike access from redevelopment
- Davis/San Leandro/Alvarado all slated for new bike lanes

Bayfair

Off-station access issues

- Safe Routes to Transit grant for personal security lighting, sight lines
- Tunnel to west side of tracks
- Coelho Drive tunnel has no bike lanes
- Hesperian Blvd has bike lanes

Hayward

Off-station access issues

- Main issue C Street tunnel goes through the station and needs to be more bike-friendly
- Bike/ped crossing at railroad (same problem as San Leandro)
- East side of station has bike parking, needs some on west side
- Overall not a bad station for biking

South Hayward Station

No comments

Union City

On-station/parking issues

- Has TOD been accompanied by more bike parking at the station?

Off-station access issues

- What are the plans to cross railroad tracks to/from future TOD?
- Decoto has bike lanes but adjacent to BART parking lot
- Is issue of BART passengers parking cars in bike lane solved?

Fremont

On-station/parking issues

- Parking lot comfortable for bikes

Off-station access issues

- Warm Springs opportunity for trail to sports fields
- Walnut Avenue improvements

Castro Valley

Off-station access issues

- Station only bike accessible from north side
- Redwood Road is bad to ride on
- Needs signage from Castro Valley Blvd and Wilbeam Ave
- Redwood undercrossing under I-580 has no bike lane; only accessible from south (see County Bike Plan for plans to address)

West Dublin/Pleasanton

Off-station access issues

- To access bike parking from Golden Gate Drive, have to walk over north walkway, walk through the station, head down the south walkway to south side of station
- Dublin Blvd at I-680 has no bike lanes
- Stoneridge Mall Rd has no bike lanes
- Gap in bike lanes between Pleasanton and San Ramon

Dublin/Pleasanton

On-station/parking issues

- Signs posted saying not to ride in parking lot
- Excellent location of bike parking, there needs to be more
- Photo opportunity of bikes locked to light stands and railings
- From station to Iron Horse Trail no curb cut so cyclists stay on sidewalk

Off-station access issues

- TIGER II projects
- Owens Drive has no pedestrian crossing opportunities (nearly a half mile between crossing opportunities)
- Willow Road bike lanes end before Owens Drive (crossing Owens is very difficult because it's a huge intersection)

General Issues/Systemwide Comments

Bike parking issues

- eLockers not full at Rockridge and some other stations, while full at others (Lake Merritt)...perhaps an issue of placement/advertising?
- Need to promote BikeLink/Bike Station...perhaps a video like SFPark program?
- BikeLink needs to be Clipper-compatible systemwide

Station access issues

- Should be two-way bike paths that loop around each station to access any/all bike paths and entry/exit points
- "Bus Only" lanes should allow bikes too
- BART needs to work with the surrounding jurisdictions on streets/access
- BART should actively work with junior colleges for increased bike access
- BART should increase bike access to regional trails
- Urge local jurisdictions that have "Bikes May Use Sidewalk" signs to build those sidewalks to 10 feet wide

- Add curb-cuts to that allow bicyclists to ride all the way bike parking areas

Signage issues

- All stations should have a map/signage of elevator locations
- Need maps/signage at each station on how to access the station via bike. Post them on the platform, bike parking area and other appropriate areas
- There needs to be systemwide, uniform signage to connect BART stations with regional bike paths
- Create a signage program for bike access in areas surrounding BART stations and request that local jurisdictions fund and install those signs.
- Change "BUS ONLY" signs to "BUS ONLY, emergency vehicles and bicycles permitted," and add sharrows as appropriate to bus lanes

Inter-Agency Planning Suggestions for BART

- Request that MTC and ABAG adopt resolutions indicating that getting bicyclists to BART stations is a worthy priority.
- Encourage congestion management agencies (CMAs) to fund BART station bike access projects
- Provide input to any up-dates of bike plans that include BART stations.
- Request local jurisdictions to include in General Plans easy access to BART station access without an automobile

Ideas for Online Survey

- Are "Walk Bike Here" signs being followed?
- Are you familiar/do you understand BikeLink?
- What prompted you to start biking to BART?
- Would you prefer using escalators at BART stations?

San Francisco Bicycle Coalition meeting, 6/8/11

Issues Specific to San Francisco BART Stations

Embarcadero

On-station/parking issues

- Where are the elevators?
- Need a second elevator to reach platform
- Bike station is good for self-service, but needs wayfinding
- No short-term bike parking, just Bike Station

Montgomery

On-station/parking issues

- Where is the elevator? Needs a bike icon.
- Elevator approach is dark and scary and needs lighting and signage
- No bike parking

Powell

On-station/parking issues

- Better to have above-ground storefront Bike Station, not necessary at station

Off-station access issues

- Wayfinding from station to station, on 5th Street, Market Street...see official routes

Civic Center

On-station/parking issues

- Activate storefronts with an on-street Bike Station
- Excellent parking, very well utilized, some theft but not too much

Off-station access issues

- Wayfinding to elevator needed
- Easy to find parking, but coming from west (Mission Street) it's invisible
- 7th/8th/Market/Grove need improved bike routes

16th Street/Mission

On-station/parking issues

- Bike channel, wayfinding to this stairway

Off-station access issues

- Safe Routes To Transit project on 17th Street bike lanes (Hoffman to Mission)

Glen Park

On-station/parking issues

- Opportunity for street level Bike Station? Partner with SF Dept of Environment

Off-station access issues

- Recent street improvements on Bosworth Street and San Jose Avenue provide good access

Balboa Park

On-station/parking issues

- Bike Station opportunity at station—long term?

Off-station access issues

- Recent path ribbon-cutting
- MTA has money for a crosswalk across Ocean Avenue
- Need better access and wayfinding from Ocean Avenue

General Issues/Systemwide Comments

Station/bike parking issues

- Lockers not appropriate in dense San Francisco
- Berkeley above ground Bike Station is a good model
- sfbike.org/bike has a pdf of a study on escalator access for bikes (Rotterdam transportation tunnel example)
- Platform access from station
- Stairs are ok for some
- Elevators smell like urine

Station access issues

- Wayfinding needs a systemwide protocol to identify where parking is, where nearby destinations are, and where stations are (pilot wayfinding project from 8 years ago?)

Other issues

- Station agents don't know bike policies (e.g. folding bikes)
- Increased blackout hours not good because shadow gets bigger and less room for flexibility
- Liberating blackout period...dedicated car or half of a car (NYC 24/7 governed by courtesy)

San Mateo County

As a virtual organization, San Mateo County's bicycle advocacy group, Bike San Mateo County, did not physically meet as did the organizations in the other BART counties. However, the same materials—an explanation of the process and aerial photographs of each station—were posted on the group's website and comments were solicited. Although no specific comments regarding the six stations in San Mateo County were received, it is expected that members of Bike San Mateo County will have comments on the Draft BART Bicycle Plan.

Countywide bicycle advisory committee comments

Contra Costa Transportation Authority
Bicycle/Pedestrian Advisory Committee
meeting, 7/25/11

Issues Specific to Contra Costa County BART Stations

Pittsburg/Bay Point

Off-station access issues

- Make BART Bike Plan consistent with Station Area Specific Plan for high-density development
- Coordinate with Bailey Road Pedestrian and Bicycle Improvement Plan
- Improve Bailey Road crossing and station access from Delta De Anza Trail

North Concord

Off-station access issues

- Connection needed from station to Port Chicago Hwy —existing trail is unfinished, needs better access from North Concord to station
- Delta Diablo Trail to BART needs connection
- Naval Weapons Station eventually housing and trail opportunities

Concord

Off-station access issues

- Bike route from east parking lot to Contra Costa Canal trail via Mt. Diablo St. and Maria Avenue
- Bank of America property just purchased (Oak/Galindo)—bike connections could be made to improve local access

Pleasant Hill

Off-station access issues

- Construct shortcut path to Pleasant Hill BART to reduce travel distance by 3/4 mile

Walnut Creek

Off-station access issues

- EBRPD wants connection to Iron Horse Trail
- Development proposal to replace existing office with residential development needs to include trail and have route identification to station
- Barrier to west side of 680 freeway via Ignacio Valley Rd

Lafayette

On-station/parking issues

- Accessing Diablo Trail requires going through BART fare gates
- No lockers on south side of station

Off-station access issues

- Oak Hill Road (from Diablo Trail)—need to cross freeway off-ramp and eastern parking lot, lighting also
- City feasibility study along EBMUD aqueduct
- Oak Hill and Deer Hill off-ramps—issues with Caltrans

Orinda

Off-station access issues

- City wants to connect Moraga Way with Orinda Way to help decrease congestion on Camino Pablo overcrossing
- Wilder project, city trail master plan—south from station on Caltrans' right-of-way on easy side of freeway
- Connect BART station and St Stephen's Trail along Highway 24 and on Bryant Way

El Cerrito Del Norte

Off-station access issues

- Specific Plan around station area? Yvette?

General Issues/Systemwide Comments

- Use 1976/78 "BART and Trails" for historic context
- Include findings from BART-sponsored access studies at Walnut Creek, Pleasanton, San Leandro, Union City stations
- Look at parking lot improvements and how they relate to bikes

Alameda County Transportation Commission,
Bicycle/Pedestrian Advisory Committee
meeting, 7/26/11

Issues Specific to Alameda County BART Stations

El Cerrito Plaza Station

On-station/parking issues

- El Cerrito Plaza bike link lockers need maintenance

Macarthur Station

Off-station access issues

- Bike lanes on 40th Street

Hayward Station

On-station/parking issues

- Escalators needed on west side of station

San Leandro Station

On-station/parking issues

- San Leandro needs more ramps
- Escalator needed

Off-station access issues

- Sidewalks are not wide enough to accommodate pedestrians and bikes

Fruitvale Station

On-station/parking issues

- Fruitvale and Berkeley bike stations limited to commute hours, especially no option at Fruitvale

Off-station access issues

- Bike access was never identified when parking structure went in. Need safe bicycle network connection from Alameda/Fruitvale Avenues around parking garage

Dublin/Pleasanton Station

Off-station access issues

- Iron Horse Trail goes right through station
- Dublin/Pleasanton: Trail to Hacienda

Fremont Station

On-station/parking issues

- No ADA-accessible fare gates

Off-station access issues

- Four access routes to Fremont station...shared with pedestrians or motor vehicles

Rockridge Station

On-station/parking issues

- No ADA-accessible fare gates

Bay Fair Station

On-station/parking issues

- Bay Fair parking lot scary for cyclists on BART property. Directional signs and sharrows needed

Ashby Station

Off-station access issues

- No direct bike access

General Issues/Systemwide Comments

- Each BART station has obstacles for bikes
- Increase the number of senior citizens riding to BART by bike
- BART refuses anyone to ride through stations with walk bike signs...can be a far walk...plenty of room for cyclists and bike access.
- Payment needed for valet, but self-parking pay required=incongruous
- Vertical racks on last car
- Need to ID where 1st car will be or change to middle car

San Francisco Bicycle Advisory Committee, Meeting
7/28/11

Issues Specific to San Francisco County BART Stations

Balboa Park

Off-station access issues

- The pedestrian/bike bridge over Ocean Avenue should be redesigned to cross Geneva Avenue also, when the time arrives to rebuild it. This will provide better access from City College.
- Convert service road under BART tracks between Balboa Park and Daly City into a bike path

General Issues/Systemwide Comments

- Signs around stations should promote helmet use

City/County Association of Governments of San
Mateo County, Bicycle Pedestrian Advisory
Committee, Meeting 7/28/11

Issues Specific to San Mateo BART Stations

South San Francisco

On-station/parking issues

- Need additional bike lockers

Colma

Off-station access issues

- Maintain the path that meets Alberti Teggia and install new crossing to it, between the corner of Reiner and A Streets

General Issues/Systemwide Comments

- Need wayfinding signs on local streets to the stations and to the bike parking at stations.
- Promote greater use of foldable bikes.
- Install bike-sharing pods at stations; offer the ability to pay using BART passes or Clipper cards.
- Address current on-board access issues in the existing conditions chapter.
- Conduct public outreach to major employers near BART stations.

E | History of Station Improvements

Home origin stations	Bicyclists per avg 1998 weekday	Bicycle % (1998)	Bicyclists per avg 2008 weekday	Bicycle % (2008)	% point change	% change	Improvements	Improvement classification	Community
12 th St. / Oakland City Center	44	1.1%	73	2.6%	1.5%	128%	No BART bike parking (City of Oakland facilities at street level)	None	East Bay Mid
16 th St. Mission	164	3.4%	263	5.4%	2.1%	62%	77 paid area wave racks and signage (2000). Stair channel (2007)	Medium	SF
19 th St. / Oakland	52	2.5%	154	6.2%	3.7%	152%	64 rack spaces on concourse level, double-deckers from Berkeley (2010-after 2008 survey)	Medium	East Bay Mid
24 th St. Mission	111	1.4%	420	4.8%	3.4%	237%	70 paid area racks (2005)	Medium	SF
Ashby	204	7.4%	385	11.7%	4.4%	59%	93 rack spaces added (2001/02). 12 retrofitted electronic lockers plus 24 are keyed metal lockers (2007/2008).	Medium	East Bay North
Balboa Park	53	0.7%	183	1.9%	1.2%	168%	30 rack spaces added (2001/02). 65 paid area racks (2006)	Medium	SF
Bay Fair	64	1.9%	98	2.2%	0.3%	14%	42 rack spaces added (2001/02). 16 keyed metal lockers—from San Leandro (2007/2008)	Medium	East Bay South
Castro Valley	16	1.0%	40	1.9%	0.9%	96%	None	Low	East Bay East
Civic Center / UN Plaza	157	4.5%	198	4.5%	0.0%	0%	63 paid area racks (2005)	Medium	SF
Coliseum / Oakland Airport	57	2.2%	13	0.5%	-1.7%	-78%	63 rack spaces added (2001/02).	Medium	East Bay South
Colma	N/A	N/A	22	0.7%	0.7%		24 rack spaces at opening, 24 keyed lockers (June 2003)	Low	Daly City South
Concord	60	1.5%	129	3.0%	1.5%	104%	119 rack spaces added (2001/02). 16	High	East Bay East

E | History of station improvements

Home origin stations	Bicyclists per avg 1998 weekday	Bicycle % (1998)	Bicyclists per avg 2008 weekday	Bicycle % (2008)	% point change	% change	Improvements	Improvement classification	Community
							Bicycle Parking Network—phone reservation (2005)		
Daly City	0	0.0%	34	0.6%	0.6%		32 rack spaces added (2001/02). 20 locker spaces added (2001/02). 4 retrofitted electronic lockers (2007/2008)	Medium	Daly City South
Downtown Berkeley	180	5.8%	278	9.8%	4.0%	70%	Installation of bicycle station (1999) and expansion of bicycle station (2010)	High	East Bay North
Dublin / Pleasanton	59	1.9%	78	1.4%	-0.5%	-27%	12 retrofitted electronic lockers—from MacArthur (2007/2008)	Low	East Bay East
El Cerrito del Norte	51	0.8%	192	2.9%	2.1%	253%	154 rack spaces added (2001/02).	High	East Bay North
El Cerrito Plaza	128	3.6%	226	6.4%	2.8%	77%	94 rack spaces added (2001/02). 48 adjacent electronic lockers by City of El Cerrito (2002).	High	East Bay North
Embarcadero	137	7.6%	212	9.0%	1.4%	18%	Bike Station 130 rack spaces (2002)	High	SF
Fremont	63	2.0%	76	1.4%	-0.6%	-32%	121 rack spaces added (2001/02).	High	East Bay South
Fruitvale	224	4.3%	543	9.9%	5.6%	131%	49 rack spaces added (2001/02). Attended Bike Station (2004)	High	East Bay South
Glen Park	88	1.6%	135	2.1%	0.4%	27%	44 rack spaces added (2001/02). Paid area racks (2006)	Medium	SF
Hayward	85	3.2%	37	1.2%	-2.0%	-62%	70 rack spaces added (2001/02).	Medium	East Bay South
Lafayette	36	1.5%	53	2.0%	0.5%	32%	84 rack spaces added (2001/02).	Medium	East Bay East
Lake Merritt	114	5.4%	245	8.2%	2.8%	51%	21 rack spaces added (2001/02). 12 lockers spaces added (2001/02). 32 retrofitted electronic lockers; 20 old plastic lockers removed (2007/2008).	Medium	East Bay South
MacArthur	162	4.4%	361	8.2%	3.8%	87%	84 rack spaces added (2001/02). 40 e-lockers; old 30 keyed metal lockers and 56 plastic lockers removed (2007/2008).	High	East Bay Mid

Home origin stations	Bicyclists per avg 1998 weekday	Bicycle % (1998)	Bicyclists per avg 2008 weekday	Bicycle % (2008)	% point change	% change	Improvements	Improvement classification	Community
Millbrae	0		32	1.1%			40 rack spaces and 40 keyed locker spaces (June 2003)	Medium	Daly City South
Montgomery St.	52	2.1%	24	1.3%	-0.8%	-39%	No bicycle facilities	None	SF
North Berkeley	138	5.4%	249	8.4%	3.0%	55%	Covered wave racks, plastic lockers—58 spaces (1998). 94 rack spaces added (2001/02). 12 retrofitted electronic lockers (from MacArthur) plus 36 elockers added, and 58 plastic lockers removed (2007/2008).	High	East Bay North
North Concord / Martinez	12	0.9%	12	0.6%	-0.4%	-39.00%	30 rack spaces added (2001/02).	Low	East Bay East
Orinda	34	1.7%	43	2.0%	0.3%	18%	26 rack spaces added (2001/02). 8 keyed lockers spaces added (2001/2002).	Low	East Bay East
Pittsburg / Bay Point	46	1.3%	24	0.5%	-0.8%	-60%	None	Low	East Bay East
Pleasant Hill	119	2.2%	182	3.4%	1.3%	59%	224 rack spaces added (2001/02). 24 e-lockers (2006/07).	High	East Bay East
Powell St.	99	2.5%	78	2.0%	-0.5%	-18%	7 paid area rack spaces (2005)	Low	SF
Richmond	106	2.8%	56	2.1%	-0.7%	-25%	42 rack spaces added (2001/02). 16 electronic lockers (2006/07)	Medium	East Bay North
Rockridge	95	3.1%	166	4.8%	1.7%	54%	126 rack spaces added (2001/02). 32 elockers; 20 plastic lockers removed (2007/2008).	High	East Bay Mid
San Bruno	0		26	1.6%			18 rack spaces and 30 keyed lockers (June 2003)	Medium	Daly City South
San Leandro	48	1.5%	104	2.6%	1.1%	75%	84 rack spaces added (2001/02). Swap plastic/metal lockers (2001/02). 20 electronic lockers plus 12 keyed metal lockers; 16 keyed metal lockers moved to Bay Fair (2007/2008).	Medium	East Bay South

E | History of station improvements

Home origin stations	Bicyclists per avg 1998 weekday	Bicycle % (1998)	Bicyclists per avg 2008 weekday	Bicycle % (2008)	% point change	% change	Improvements	Improvement classification	Community
South Hayward	40	1.9%	43	1.6%	-0.3%	-17%	56 rack spaces added (2001/02).	Medium	East Bay South
South San Francisco	0		12	0.5%			30 rack spaces and 30 keyed lockers (June 2003)	Medium	Daly City South
Union City	51	2.1%	53	1.6%	-0.5%	-25%	69 rack spaces added (2001/02). 20 locker spaces added (2001/02).	Medium	East Bay South
Walnut Creek	73	2.2%	89	2.2%	0.0%	1%	91 rack spaces added (2001/02). 16 locker spaces added (2001/02).	Medium	East Bay East
West Oakland	28	0.9%	198	4.8%	3.9%	419%	84 racks spaces added (2001/02). 6 retrofitted electronic lockers—from MacArthur (2007/2008).	Medium	East Bay Mid

F | 2011 Bicycle Theft Data

Station*	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Bicycles parked in racks (one day)	Bicycles parked (normalized over 1 year)	Percent bicycle thefts
16th St/Mission	0	1	0	2	0	0	1	2	1	0	2	3	12	52	13,520	0.09%
19th St/Oakland	0	1	0	0	3	1	2	2	0	0	0	1	10	41	10,660	0.09%
24th St/Mission	0	0	3	1	2	1	1	3	1	5	2	3	22	59	15,340	0.14%
Ashby	0	3	1	4	2	5	0	5	6	7	7	4	44	92	23,920	0.18%
Balboa Park	1	1	0	3	2	1	4	0	0	0	0	0	12	30	7,800	0.15%
Bay Fair	0	0	0	3	1	2	2	2	4	4	3	0	21	19	4,940	0.43%
Castro Valley	0	0	0	0	1	4	3	5	4	3	1	1	22	2	520	4.23%
Civic Center	1	3	1	1	2	0	1	1	0	1	1	0	12	53	13,780	0.09%
Coliseum/OAK	0	0	0	0	1	0	0	0	1	1	0	0	3	6	1,560	0.19%
Colma	0	0	0	0	0	0	0	0	0	0	0	0	0	3	780	0.00%
Concord	1	5	0	3	6	2	5	2	2	1	0	0	27	29	7,540	0.36%
Daly City	0	0	0	0	0	0	0	0	0	0	0	0	0	3	780	0.00%
Dublin/Pleasanton	5	3	1	0	5	1	7	6	4	4	4	1	41	42	10,920	0.38%
El Cerrito Del Norte	1	1	2	1	1	0	0	0	4	4	3	0	17	18	4,680	0.36%
El Cerrito Plaza	0	1	1	2	2	0	0	3	0	2	3	3	17	38	9,880	0.17%
Fremont	4	5	6	2	4	3	4	5	3	2	1	2	41	41	10,660	0.38%
Fruitvale	2	2	0	1	2	1	3	4	3	1	1	1	21	33	8,580	0.24%
Glen Park	1	0	0	0	1	1	0	0	2	1	1	0	7	24	6,240	0.11%
Hayward	0	0	1	0	2	2	2	2	1	4	0	3	17	31	8,060	0.21%
Lafayette	0	0	1	0	0	2	1	2	5	7	4	1	23	26	6,760	0.34%
Lake Merritt	0	0	0	2	0	0	3	1	2	2	1	2	13	18	4,680	0.28%
MacArthur	3	1	3	0	3	4	7	1	4	5	4	3	38	120	31,200	0.12%

Station*	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Bicycles parked in racks (one day)	Bicycles parked (normalized over 1 year)	Percent bicycle thefts
Millbrae	0	1	1	0	0	0	0	1	0	0	0	0	3	5	1,300	0.23%
North Berkeley	1	2	1	4	1	0	0	4	11	7	3	2	36	110	28,600	0.13%
North Concord/Martinez	1	0	0	0	0	0	1	0	1	0	1	1	5	2	520	0.96%
Orinda	0	0	1	0	2	0	0	1	0	2	2	1	9	8	2,080	0.43%
Pittsburg/Bay Point	0	0	0	0	0	0	0	0	1	1	1	1	4	8	2,080	0.19%
Pleasant Hill	3	4	1	2	3	3	7	9	5	2	3	1	43	95	24,700	0.17%
Powell	0	1	0	1	0	0	0	1	0	1	0	0	4	7	1,820	0.22%
Richmond	1	1	1	0	2	0	0	1	1	1	2	0	10	12	3,120	0.32%
Rockridge	1	0	0	0	2	3	2	2	1	2	1	2	16	72	18,720	0.09%
San Bruno	2	1	1	0	0	1	0	3	1	1	1	0	11	9	2,340	0.47%
San Leandro	2	2	0	2	2	0	2	3	2	1	1	1	18	22	5,720	0.31%
South Hayward	0	0	0	0	1	0	1	0	0	1	0	1	4	9	2,340	0.17%
South San Francisco	0	0	0	0	2	2	1	1	1	0	0	0	7	2	520	1.35%
Union City	0	0	1	0	2	0	0	2	4	3	4	0	16	3	780	2.05%
Walnut Creek	4	4	5	1	5	4	5	9	7	7	3	6	60	49	12,740	0.47%
West Dublin/Pleasanton	0	1	0	2	3	2	3	3	2	2	2	1	21	11	2,860	0.73%
West Oakland	2	0	1	2	3	1	3	1	2	3	0	2	20	31	8,060	0.25%
All Stations	37	46	33	40	71	47	72	88	87	89	64	47	721	1232		

* The number of parked bicycles listed at 19th Street station does not include street level racks since they are not on BART property and, therefore, BART police do not have a record of thefts at this location. Bicycle racks at the 12th Street and Downtown Berkeley stations are not on BART property, so BART police do not have a record of thefts at these stations. There is no bicycle parking at Montgomery or San Francisco International Airport stations and no bicycle racks at Embarcadero station.

G | Needed Station Area Improvements

This appendix contains a list of station area improvements to facilities outside of BART property expected to encourage bicycle access to BART stations. Since this list is intended to aid local efforts to secure funding for these projects, it is meant to include just

those identified in local bicycle plans. Please see Appendix D for other potential improvements, suggested by countywide advocates and BPAC members.

Issues Specific to Alameda County BART Stations

Station	Source	Project description and location	Strategy type
12th St	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Franklin between 8th and 14th	Class II bike lane
12th St	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Webster between 8th and 14th	Class II bike lane
12th St	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on 14th St, Brush St to Oak St	Class II bike lane / Oakland Class III A
12th St	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Clay St, San Pablo Ave to 9th St	Class II bike lane
12th St	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on the 8 th /9 th Street couplet between Martin Luther King Jr Way and Harrison Street	Mixed class bikeway
12th St	City of Oakland Bicycle Plan (2007)	Construct Class III A arterial bike route on Telegraph Avenue between 16 th and 20 th Streets	Class III bike route
12 th St	City of Oakland Bicycle Plan (2007)	Construct Class III A route on 14th Street	Class III A bike route
19th St	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Webster between 8th and 14th	Class II bike lane
19th St	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on 20th St, Telegraph Ave to Harrison St	mixed
19th St	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on Telegraph Ave from Broadway to 20th St	mixed
19th St	City of Oakland Bicycle Plan (2007)	Construct bike lanes on Harrison St/Lakeside Dr, Grand Ave to Madison St	Class II bike lane
19th St	City of Oakland Bicycle Plan (2007)	Construct bike lanes on Martin Luther King Jr Way between 2 nd Street and San Pablo Avenue	Class II bike lane
Ashby	Berkeley Bicycle Plan (2005)	Connect station to Milvia Street Bicycle boulevard via intersection improvements at Adeline/Ashby.	Intersection improvement

Ashby	Berkeley Bicycle Plan (2005)	Improvements to Woolsey Class III Bicycle Route on both east and west sides of station, potentially including traffic calming, signs and markings.	Class III bike route
Ashby	Berkeley Bicycle Plan (2005)	Connection to King Bicycle boulevard via improved bike crossing at Woolsey/MLK (signs, markings, flashing warning lights or a "HAWK" signal).	Intersection Improvement
Ashby	Berkeley Bicycle Plan (2005)	Connection to Woolsey Class III Bicycle Route via an improved bike crossing of Adeline (signs, markings, flashing warning lights or a "HAWK" signal).	Intersection Improvement
Ashby	City of Oakland Bicycle Plan (2007)	Shattuck Ave bike lanes, Berkeley border to 45th St	Class II bike lane
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Construct Class II bike lanes on access roads within Bayfair Center complex	Class II bike lane
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Redesign intersection of Coelho Drive and Mooney Avenue to simplify negotiation for all modes	Intersection improvement
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Construct Class II bike lanes along Estudillo Canal between BART station and Bayfair Center	Class II bike lane
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Widen underpass or construct separate bicycle tunnel along Thornally Drive under the BART tracks to accommodate bicycles	Network gap
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Construct Class II bike lanes on Fairmont Avenue east of Hesperian Boulevard	Class II bike lane
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Construct Class I path on BART right of way (this is not the East Bay Greenway, which veers away from the BART property at that station)	Class I path
Bay Fair	Bay Fair BART TOD & Access Plan (2007)	Construct Class II bike lanes on Thornally Drive and Coelho Drive, west of Hesperian Boulevard	Class II bike lane
Bay Fair	Urban Ecology East Bay Greenway Concept Plan (2008)	Construct East Bay Greenway	Class I path
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Hegenberger & bike boulevard on 75th Ave (for southbound access vs Hegenberger), Snell, and Hamilton	Class II bike lane
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway between San Leandro St and Mills College on 69th Ave (San Leandro St to International Blvd); Havenscourt Blvd (International Blvd to Bancroft Ave); Camden St (Bancroft Ave to MacArthur Blvd)	mixed
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on San Leandro St (54 th Avenue to San Leandro city limits)	Class II bike lane

Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Class I path along rail ROW (e.g. East Bay Greenway)	Class I path
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Construct Class I multi-use trail along Slough to Bay Trail (BART to Bay Trail connector)	Class I path
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Edgewater between MLK Jr. Shoreline path end and Hegenberger Road	Class II bike lane
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on 85 th Ave between Bancroft Ave and San Leandro St	Mixed class bikeway
Coliseum/Oakland Airport	City of Oakland Bicycle Plan (2007)	Construct Class III B bike boulevard on 54 th Ave between International Blvd and San Leandro St	Class III B bikeway
Downtown Berkeley	Berkeley SOSIP (2010)	Establish continuous Class II bike lanes or additional traffic calming/diversion (including reconfiguring University/Milvia intersection) along Milvia Bicycle boulevard between University Avenue and Allston Way	Class II bike lane or Bicycle boulevard
Downtown Berkeley	Berkeley SOSIP (2010)	Extend Class II bike lanes on Hearst Avenue from west of Shattuck Avenue to the UC campus	Class II bike lane
Downtown Berkeley	Berkeley SOSIP (2010)	Establish a northbound contraflow bicycle lane on Fulton Street between Dwight Way and Durant Avenue	Class II bike lane
Downtown Berkeley	Berkeley Bicycle Plan (2005)	Improve Center Street "Class 2.5" Bikeway from Shattuck to Oxford, including traffic calming, signs and markings.	Class III sharrow
Downtown Berkeley	Berkeley SOSIP (2010)	Reconfigure Shattuck Avenue to become a "complete street" by adding bicycle lanes south of Center Street (separate or protected lanes where feasible)	Class I pathway (directional) and/or Class II bike lane
Downtown Berkeley	Berkeley Bicycle Plan (2012, proposed)	Establish new Bicycle boulevard on Addison Street west of Milvia to provide connection to Downtown Berkeley BART from the west.	Class III Bicycle boulevard
Dublin/Pleasanton	Dublin Bikeways Master Plan (2007)	Construct Trail along edge of future TOD projects, trail just west of 4480 Hacienda Drive and south of 4460 Hacienda Drive	Class I path
Dublin/Pleasanton	Dublin Bikeways Master Plan (2007)	Continue bike lanes to intersections and install bike detection at intersections within .5 miles of station	Intersection improvement
Dublin/Pleasanton	Dublin Bikeways Master Plan (2007)	Iron Horse Trail Improvements within BART station area	Class I path
Fremont	City of Fremont Bicycle Plan (2012)	Complete Class II bike lanes on Civic Center Drive near station	Class II bike lane
Fremont	City of Fremont Bicycle Plan (2012)	Construct Class I multi-use trail along UPRR ROW	Class I path

G | Needed station area improvements

Fruitvale	City of Oakland Bicycle Plan (2007)	Construct East Bay Greenway (Class I multi-use trail)	Class I path
Fruitvale	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on E 12th St	Class II bike lane / Class III bike route
Fruitvale	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on Foothill Blvd between 14 th Ave and Fremont Way	Mixed class bikeway
Hayward	City of Hayward Bicycle Plan (2007)	Construct East Bay Greenway (Class I multi-use trail)	Class I path
Hayward	City of Hayward Bicycle Plan (2007)	Construct Class II bike lanes on B and C streets (west of BART station)	Class II bike lane
Hayward	City of Hayward Bicycle Plan (2007)	Construct Class III routes on Montgomery to the north of station and C street to the east of station	Class III bike route
Lake Merritt	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Madison/Oak Streets (couplet)	Class II bike lane
Lake Merritt	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on 8th and 9th Streets (couplet, Harrison St to Oak St)	Class II bike lane
Lake Merritt	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on Franklin/Webster Streets (8th/9th Sts, couplet)	Class II bike lane
Lake Merritt	City of Oakland Bicycle Plan (2007)	Construct Class II bike lane on 10th Street east of Madison Street	Class II bike lane
Lake Merritt	City of Oakland Bicycle Plan (2007)	Construct Class III A route on 14th Street	Class III A bike route
Lake Merritt	City of Oakland Bicycle Plan (2007)	Construct mixed class bikeway on the 8 th /9 th Street couplet between Webster and Oak Streets	Mixed class bikeway
MacArthur	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on West MacArthur Boulevard between Market Street and Telegraph Ave	Class II bike lane
MacArthur	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes on West MacArthur Boulevard between Telegraph Ave and Broadway	Class II bike lane
MacArthur	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes along Telegraph Avenue between 20th Street and Highway 24	Class II bike lane
MacArthur	City of Oakland Bicycle Plan (2007)	Construct Class II bike lanes along 40th Street from Adeline St to MLK and Telegraph Ave to Webster St	Class II bike lane
MacArthur	MacArthur BART AFS (2008)	Signalize West MacArthur Boulevard/Frontage Road/37th Street intersection (bicycle detection included) to connect BART station and West MacArthur Boulevard. Remove a portion of the West MacArthur Boulevard median to allow all movements to and from both Frontage Road and 37th Street.	Intersection improvement
North Berkeley	Berkeley Bicycle Plan	Install bicycle crossing signal or flashing beacons	Intersection

	(2005)	(HAWK or RRFB) along with improved signs and markings at Virginia Bicycle boulevard crossing of Sacramento.	improvement
North Berkeley	Berkeley Bicycle Plan (2005)	Improve the Ohlone Greenway crossing of Sacramento at Delaware (potentially including signs and markings, and signal timing).	Intersection improvement
North Berkeley	Berkeley Bicycle Plan (2005)	Improve the on-street bikeway on Delaware around the station using signs and markings.	Class II bike lane
North Berkeley	Berkeley Bicycle Plan (2005)	Improve the Class III Bike Route on Acton on the approach from the north and south and alongside the station, using signage, markings and traffic calming improvements.	Class III bike route
North Berkeley	Berkeley Bicycle Plan (2005)	Traffic calming improvements on the Virginia Bicycle boulevard east and west of the station.	Bicycle boulevard
North Berkeley	Berkeley Bicycle Plan (2005)	Widen and improve the Ohlone Greenway to the north of the station.	Class I Pathway
Rockridge	City of Oakland Bike Plan (2007)	Construct Class 3A Arterial Bike Route on College Ave between Alcatraz Ave and Broadway	Oakland Class III A
Rockridge	City of Oakland Bike Plan (2007)	Construct Class 3B Bike Boulevards on Miles Ave between Forest St and College Ave, and on Shafter Ave between Forest St and College Ave .	Bicycle boulevard
Rockridge	City of Oakland Bike Plan (2007)	Construct Class 3B Bike Boulevard on Lawton Ave, Broadway to College Ave	Bicycle boulevard
Rockridge	City of Oakland Bike Plan (2007)	Construct Class 3B Bike Boulevard on Chabot Rd, College Ave to Golden Gate	Bicycle boulevard
Rockridge	City of Oakland Bike Plan (2007)	Construct Class II bike lanes on Claremont Ave, between City of Berkeley border and Telegraph Ave	Class II bike lane
Rockridge	City of Oakland Bike Plan (2007)	Construct Class II bike lanes on Alcatraz Ave between Dover St and College Ave	Class II bike lane
Rockridge	City of Oakland Bike Plan (2007)	Construct Class II bike lanes on Tunnel Rd/Caldecott Way/Broadway between City of Berkeley border and W MacArthur Blvd	Class II bike lane
Rockridge	City of Oakland Bike Plan (2007)	Construct mixed class bikeway on 51 st St/Pleasant Valley Rd between Shattuck Ave and City of Piedmont border	Class II bike lane
San Leandro	Downtown San Leandro TOD Strategy (2007)	Construct Class III routes on Oakes Boulevard, Chumalia Street and Harrison Street; West Estudillo Avenue west of San Leandro Boulevard; West Joaquin Avenue between San Leandro Boulevard and Hays Street; Santa Rosa Street between Estudillo Avenue and Dolores Avenue; Castro Street between East 14th and Alvarado Streets	Class III bike route

San Leandro	Downtown San Leandro TOD Strategy (2007)	Construct Class I routes along the East Bay Greenway corridor along the BART right-of-way and in the creekside linear park between East 14th Street and the UPRR line	Class I path
San Leandro	Downtown San Leandro TOD Strategy (2007)	Construct Class II bike lanes on Williams Street between San Leandro Boulevard and Hays Street, on Parrott Street between San Leandro Boulevard and Washington Avenue, and on Hays Street between Davis Street and West Juana Avenue if reconfigured to one-way travel	Class II bike lane
South Hayward	South Hayward BART Access Study (2011)	Construct Class I path along Union Pacific Railroad tracks (UP Regional Trail)	Class I path
South Hayward	South Hayward BART Access Study (2011)	Link the Nuestro Parquecito bikeway to the BART station by providing a Class I path along BART right-of-way (East Bay Greenway)	Class I path
South Hayward	South Hayward BART Access Study (2011)	Construct pedestrian/bicycle bridge linking East Bay Greenway to A Street	Network gap
Union City	Union City Pedestrian and Bicycle Plan (proposed 2012)	Complete bike/ped connection/promenade (to the east of station)	Class I path
West Dublin/Pleasanton	City of Dublin Bicycle Plan (2007)	Construct Class II bike lanes on Dublin Blvd, St Patrick Way, and Golden Gate Drive	Class II bike lane
West Oakland	City of Oakland Bike Plan (2007)	Construct Class II bike lanes on Peralta Street	Class II bike lane
West Oakland	City of Oakland Bike Plan (2007)	Construct Class II bike lanes on Adeline St between 3 rd St and City of Emeryville border	Class II bike lane
West Oakland	City of Oakland Bike Plan (2007)	Construct Class III B bike boulevard on 8 th St, Market St and Wood St between 8 th and 7 th Sts	Class III B bike blvd

Issues Specific to Contra Costa County BART Stations

Station	Source	Project description and location	Strategy type
Concord	Concord Trails Master Plan (2012)	Improve connections to downtown Concord: establish a Class III bike route from the west BART parking lot to downtown Concord via Grant Street and Salvio Street.	Class III bike route
El Cerrito del Norte	WCCTAC Transit Enhancement Study (2011)	Install new mid-block crossing to connect Richmond and Ohlone Greenway at San Pablo Avenue	Intersection improvement
El Cerrito del Norte	WCCTAC Transit Enhancement Study (2011)	Enhance the Elm St/Hill St/Key Blvd intersection by adding bike box for NB bicyclists on Elm Street (good for left	Intersection improvement

Station	Source	Project description and location	Strategy type
		turn onto Key Blvd)	
El Cerrito del Norte	WCCTAC Transit Enhancement Study (2011)	Make improvements to Ohlone Greenway	Class I path
El Cerrito del Norte	WCCTAC Transit Enhancement Study (2011)	Install bicycle lanes on Portrero Avenue between the Ohlone Greenway and Carlson Blvd.	Class II bike lanes
El Cerrito del Norte	WCCTAC Transit Enhancement Study (2011)	Install Class III bike boulevard on Portrero Avenue between Navallier Street and the Ohlone Greenway	Class III bike boulevard
El Cerrito del Norte	El Cerrito Circulation Plan for Bicyclists and Pedestrians (2007)	Install Class III bike route on Hill Street between the Ohlone Greenway and Elm	Class III bike route
El Cerrito del Norte	El Cerrito Circulation Plan for Bicyclists and Pedestrians (2007)	Construct Class I path on south side of Hill Street between San Pablo Avenue and the Ohlone Greenway	Class III bike route
El Cerrito del Norte	El Cerrito Circulation Plan for Bicyclists and Pedestrians (2007)	Install Class III shared roadway signs and markings on Richmond Street from Blake Street to Moeser Lane	Class III bike route
El Cerrito Plaza	WCCTAC Transit Enhancement Study (2011)	Provide a direct Class I connection to Bay Trail along hillside between I-580/Central Avenue Overpass and Rydin Road	Class I path
El Cerrito Plaza	WCCTAC Transit Enhancement Study (2011)	Construct Class I path from Central Avenue to Santa Clara Street via Central Park. Also provide pathway connection through Central Park	Class I path
El Cerrito Plaza	WCCTAC Transit Enhancement Study (2011)	Construct Class III bike route on San Luis Street/San Diego Street/Santa Clara Street/Lassen Street between Central Avenue and Lassen Street, and between Ohlone Greenway and San Luis St	Class III bike route
El Cerrito Plaza	WCCTAC Transit Enhancement Study (2011)	Make improvements to Ohlone Greenway	Class I path
El Cerrito Plaza	WCCTAC Transit Enhancement Study (2011)	Install Class II bike lanes on I-580/Central Avenue overpass	Class II bike lanes
El Cerrito Plaza	WCCTAC Transit Enhancement Study (2011)	Install Class I path along south side of underpass along Central Avenue between San Luis Street and San	Class II bike lanes

Station	Source	Project description and location	Strategy type
Joaquin Street			
El Cerrito Plaza	WCCTAC Transit Enhancement Study (2011)	Construct Class I path along Cerrito Creek to connect to Bay Trail	Class I path
Lafayette	Lafayette staff, Lafayette City Bikeways Master Plan	Implement the proposed path along the EBMUD Aqueduct ROW near the BART Station (Phase 1 - link to BART station from west side; also bridge over Happy Valley Road and ramp into station's plaza level on south side).	Class I path
Lafayette	Lafayette staff, Lafayette City Bikeways Master Plan	Implement Bicycle boulevard improvements along Lafayette Circle (East and West), Hough Ave and the Downtown Bypass Route streets.	Bicycle boulevard
Pittsburg/Bay Point	Bailey Road Ped Bike Plan (2010)	Fill in gaps in the Class II bike lane on Bailey Road between Willow Pass Road and the BART Access Road	Class II bike lane
Pittsburg/Bay Point	Bailey Road Ped Bike Plan (2010)	At Bailey Road/SR 4, remove the north-side loop off-ramp entirely and improve the west side surface sidewalk and bicycle lanes	Intersection improvement
Pittsburg/Bay Point	Bailey Road Ped Bike Plan (2010)	At Bailey Road/SR 4, improve the westbound (directional) off-ramp at the east side of Bailey Road to accommodate both northbound and southbound traffic turning onto Bailey Road	Intersection improvement
Pittsburg/Bay Point	Bailey Road Ped Bike Plan (2010)	At Bailey Road/SR 4, change the south-side loop off-ramp to a fully signal-controlled T-intersection at Bailey Road. This will eliminate the separated right turn lane from eastbound State Route 4 to northbound Bailey Road.	Intersection improvement
Richmond	WCCTAC Transit Enhancement Study (2011)	Implement streetscape improvements on 23rd Street between Emeric Avenue and Bissell Avenue that include a road diet, sidewalk & crossing enhancements, and a Class III route	Class III bike route
Richmond	WCCTAC Transit Enhancement Study (2011)	Construct Class I path along the BART track alignment on the west side of Portola Avenue, connecting to future	Class I path

Station	Source	Project description and location	Strategy type
		Roosevelt Avenue bike boulevard and 13th Street Class II bike lanes	
Richmond	WCCTAC Transit Enhancement Study (2011)	Construct Class III bike boulevard on Roosevelt Avenue between Wilson Avenue and 15th Street, including signage, sharrows, and traffic circles	Bike boulevard
Richmond	WCCTAC Transit Enhancement Study (2011)	Construct Class III bike boulevard on 19th Street between Pennsylvania Avenue and Nevin Avenue, including signage, sharrows, and traffic circles	Bike boulevard
Richmond	WCCTAC Transit Enhancement Study (2011)	Construct Class III bike boulevard on Marina Way between MacDonald Avenue and Ohio Avenue, including signage, sharrows, and potential traffic calming treatments	Bike boulevard
Richmond	WCCTAC Transit Enhancement Study (2011)	Construct Class III bike route on 15th Street between MacDonald Avenue and Richmond Greenway	Class III route
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Construct Class I bike/ped overcrossing over Ygnacio Valley Road between Walnut Creek BART station and south side of YVR, leading to downtown Walnut Creek	Class I overcrossing
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Construct Class I path linking Iron Horse Trail with Walnut Creek BART station	Class I path
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Construct Class I path or Class II lanes linking Oakland Blvd. to Ygnacio Valley Road	Class I path or Class II lanes
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Widen existing sidewalks on Ygnacio Valley Road to provide minimum 10' clearance for joint bike/ped use or widen sidewalks to 15' with roadway separation.	Class I shared use path
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Provide Class II bike lanes on Hillside Drive.	Class II bicycle lanes
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Provide Class II bike lanes or Class III sharrows on Parkside Drive, between Hillside Drive and North Civic	Class II bicycle lanes or Class III sharrows
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Provide Class II bike lanes or Class III sharrows on Pringle Avenue between Riviera and N. California Drive	Class II bicycle lanes or Class III sharrows

Station	Source	Project description and location	Strategy type
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Complete Class II facility on N. California between Bonanza Street and Civic Drive	Class II bicycle lanes
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Extend Class II bike lanes on N. California from Pringle Avenue to North Main Street	Class II bicycle lanes
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Install Class II bike lanes or Class III facility on Pine Street between North Civic Drive and North Main Street	Class II bicycle lanes or Class III bicycle route
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Provide Class II bike lanes or Class III sharrows on North Civic between California Blvd. and Walden Road	Class II bicycle lanes or Class III sharrows
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Construct Class II bike lanes or Class III sharrows on Riviera Drive between Pringle Avenue and Parkside Drive	Class II bicycle lanes or Class III sharrows
Walnut Creek	Walnut Creek Bicycle Plan (2011)	Construct Class III sharrows on Buena Vista from Geary Road to Hillside Drive	Class III sharrows

Issues Specific to San Francisco BART Stations

Station	Source	Project description and location	Strategy type
Balboa Park	Balboa Park Station Area Plan (2008)	Construct Class II bike lanes on Ocean Avenue east to San Jose Ave	Class II bike lane
Balboa Park	Balboa Park Station Area Plan (2008)	Construct Class II bike lanes on Phelan Avenue north to Judson Ave	Class II bike lane
Balboa Park	Balboa Park Station Area Plan (2008)	Provide bicycle improvements along Holloway Avenue	Class III bike route
Glen Park	Glen Park Community Plan (2011)	Construct Class II bike lanes on Lyell Street	Class II bike lane
Glen Park	Glen Park Community Plan (2011)	Construct Class II bike lanes on Bosworth Street between Diamond and Rotteck Streets	Class II bike lane
Glen Park	Glen Park Community Plan (2011)	Construct Class II bike lanes on Monterey Boulevard on- and off- ramps from San Jose Avenue	Class II bike lane

Issues Specific to San Mateo County BART Stations

Station	Source	Project description and location	Strategy type
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Colma	Colma Station Area Plan - 1994	Construct Class II bike lanes on designated priority north-south and east-west bicycle corridors leading to the Colma BART Station and the Holy Angels Church, including: El Camino Real, San Pedro Road, and A Street.	
Millbrae	Millbrae Bicycle and Pedestrian Transportation Plan August 2009	Millbrae Avenue Pedestrian Overcrossing at US101	Class I path
Millbrae	Millbrae Station Area Specific Plan 1998	Millbrae and Rollins Intersection Improvement and Expansion	Intersection improvement
Millbrae	N/A	California Drive and Linden Intersection Safety Improvement	Intersection improvement
South San Francisco	SSF Bicycle Plan (2011)	Install sharrows adjacent to and leading to the BART station on the following roadways: Mission Road (Lawndale to Oak Ave), McLellan (El Camino to Mission Rd), Holly (Mission to Hillside), Miller (Evergreen to Holly)	Class III sharrow
South San Francisco	SSF Bicycle Plan (2011)	Improve bicycle access through intersections by adding bicycle detection for bikes at the following locations: McLellan/Lawndale and Mission Road, BART and McLellan, BART and El Camino, El Camino and McLellan, and El Camino and Costco.	Intersection improvement
South San Francisco	El Camino Real/Chestnut Ave Area Plan, Grand Boulevard Initiative's Complete Streets	Implement traffic calming designs to create a safer Class III lane environment	Class III route

H | Investment Tool User's Guide

The memorandum beginning on the following page describes the “user’s guide” for the BART Bicycle Investment Tool.

MEMORANDUM

Date: February 23, 2012

To: Steve Beroldo, BART

From: Mackenzie Watten and Brooke DuBose, Fehr & Peers

Subject: BART Bicycle Plan Update – BART Bicycle Investment Tool User's Guide

SF11-0545

This memorandum is a user's guide for the BART Bicycle Investment Tool¹. The BART Bicycle Investment Tool is a Microsoft Excel based tool that uses the data results from the BART Bicycle Direct Ridership Model (DRM). The purpose of the Investment Tool is to help users identify the most cost-effective bicycle investments in terms of their ability to encourage bicycling as a mode of travel to and/or from BART. The BART Bicycle DRM was developed as part of the BART Bicycle Access Plan Update in 2011-2012. The *BART Bicycle Plan Update – BART Bicycle Direct Ridership Model Development* memorandum, dated February 23, 2012, details the development of the bicycle direct ridership model. The BART Bicycle DRM was based on empirical relationships found through statistical analysis of BART system ridership data, the 2008 BART Passenger Profile Survey, and the 2011 online BART Bicycle Access Survey. Professional judgment was applied to the statistically valid relationships to enable a likely range of relationships for different station types.

The BART Bicycle Investment Tool allows transit agencies to evaluate the costs and benefits of bicycle access improvements at different rail station types². These benefits include the potential mode shift that different bicycle investments generate. The BART Bicycle DRM is the backbone of the Bicycle Investment Tool, and was developed using BART specific data. However, this tool was developed with the goal of being transferable to other rail transit operators. The tool works on a station type level (as defined in Table 1), allowing other transit agencies to use the station type that most closely represents their stations.

¹ This memorandum is accompanied by the *BART Bicycle Direct Ridership Model Development* memorandum, dated February 23, 2012. The BART Bicycle Investment Tool is a Microsoft Excel based tool that uses the BART Bicycle Direct Ridership Model results to identify the most cost-effective bicycle investments in terms of their ability to encourage the use of bicycles as a mode of travel to and/or from BART.

² The BART Bicycle Investment Tool was developed using BART data. Non-BART transit agencies should consider calibrating and validating the tool to match their own conditions. There are locations in the tool where the user is asked to input local data if possible. The tool also uses data results from the BART Bicycle DRM. Calibration and validation of a bicycle DRM has high data requirements. Please review the accompanying *BART Bicycle Direct Ridership Model Development* for more information.

BACKGROUND

Goal of BART Bicycle Access Plan Update

The overall goal of the BART Bicycle Plan Update is to increase the use of bicycles to access BART by developing strategies which make it easier, safer, and more convenient to ride bikes to and from stations and to park bikes at stations. One of the objectives to help realize this goal is to provide a predictive tool for BART to evaluate how bicycle investments affect bicycle mode of access based on a transparent methodology.

BART Bicycle Direct Ridership Model

The *BART Bicycle Plan Update – BART Bicycle Direct Ridership Model Development* memorandum, dated February 23, 2012, details the development of the bicycle DRM. Empirical relationships were found through statistical analysis of BART system ridership data, the 2008 BART Passenger Profile Survey, the 2011 online BART Bicycle Access Survey, and station characteristics. This model is able to predict changes in daily bicycle access ridership at individual stations based on bicycle access and parking investments. The model predicts those bicyclists who park their bicycles at the station and ride BART, and those who take their bicycles on the train. Functionally, total bicycle access ridership is first estimated. Then the percentage of that total bicycle access ridership that is park and ride (P&R) bicycle access ridership is estimated. This value allows the user to determine P&R and board with bike (BwB) bicycle access ridership separately and plan accordingly.

The models were derived from BART-specific ridership, passenger profile surveys, and station characteristics. In an effort to make the model transferrable to other jurisdictions and transit agencies, the model may be applied to a series of station typologies rather than BART stations directly. Table 1 presents the station typologies.

TABLE 1 - STATION TYPOLOGIES		
Station Typology	Description	Example BART Stations
Urban	High-ridership with high walk, bike and transit access share. No parking provided. Can be found in downtown or neighborhood business district.	12th Street Oakland, Downtown Berkeley, Embarcadero
Urban with Parking	Similar to "Urban," but with small parking lots that fill up early. Auto mode share is higher than "Urban"	Ashby, Lake Merritt, North Berkeley, Glen Park
Balanced Intermodal	Well-served by transit that serves primarily corridor and local transit. Parking provided, but fills early due to size. Can be found on urban or suburban grid network. Walk access share is moderate.	Fruitvale, MacArthur, Rockridge

TABLE 1 - STATION TYPOLOGIES		
Station Typology	Description	Example BART Stations
Intermodal – Auto Reliant	Well-served by regional and local transit. Large amounts of parking provided. Can be found on suburban grid or residential area. Walk access share is lower than average.	Daly City, El Cerrito Del Norte, Walnut Creek
Auto Dependent	Focus on auto-based access. Large station footprint, structured and/or surface parking, and adjacent highway access. Walk and transit access share predominantly below average.	East Dublin/Pleasanton, Lafayette, Pittsburg/Bay Point
Source: <i>Access BART</i> , Arup, 2006.		

ASSUMPTIONS AND CONSTRAINTS

The BART Bicycle Investment Tool uses the data results from the BART Bicycle DRM to help users evaluate the most cost-effective bicycle investments. As described in the *BART Bicycle Plan Update – BART Bicycle Direct Ridership Model Development* memorandum, the method to predict bicycle ridership is a simple process. The station area characteristics are combined with linear coefficients to predict bicycle ridership. As a linear model, the BART Bicycle DRM does not indicate that the relationship between the station area characteristics and bicycle ridership would ever cease. In terms of extremes, it means that if a user added 1,000,000 bicycle rack spaces to a station, that user could expect a bicycle ridership increase of an estimated 1,192,000 riders. Constraints are needed ensure that the Tool is useful for planners.

The Tool applies five constraints to the raw output of the BART Bicycle DRM. These constraints ensure that the model and tool results conform to planners' basic common sense. Once common sense has been engaged, the tool helps the planner evaluate the costs and benefits of bicycle investments.

Mode Share Ceiling

Bicycle access mode shares, defined as bicycle access riders divided by total station riders, are prohibited from exceeding set ceilings. These ceilings are based on the existing observed maximum mode share by station typology. A buffer of 3 percentage points was added to each of the highest mode shares by station typology to allow for some growth at the highest mode share stations. Note that, although these mode share levels exceed the systemwide Plan goal of 8% bicycle access, that figure is meant to be a systemwide average, which assumes that some stations will be below that number, while others will exceed it, Table 2 shows the final ceilings.

TABLE 2 – BICYCLE ACCESS MODE SHARE CEILING BY STATION TYPOLOGY

Station Typology	2008 Max Station	2008 Max Mode Share	Tool Max Mode Share
Urban	16th Street / Mission	5.7%	8.7%
Urban with parking	Ashby	11.3%	14.3%
Balanced Intermodal	Fruitvale	9.8%	12.8%
Intermodal / Auto Reliant	West Oakland	5.4%	8.4%
Auto Dependent	Pleasant Hill	5.2%	8.2%

Stated Preference and Peak Occupancy of Bicycle Parking Facilities

BART surveyed all types of access riders, asking them their preferred type of bicycle parking facility. This stated preference data was used to generate relative rankings of these facilities for each station and station typology. Please note that this is stated preference data which is prone to many biases. BART also collected bicycle parking peak occupancy data at each station. These two pieces of data were paired to predict if a chosen investment in a bicycle parking facility type could be reasonably expected to increase ridership.

The following logic is used to determine whether bicycle access ridership could be expected to increase based on a hypothetical increase in facility type supply:

A. Investment in a facility type with a pre-investment peak occupancy under 80% will NOT increase bicycle access ridership. The pre-investment facility type is under-utilized so adding more parking of the same type will not increase ridership.

B. Investment in a facility type that does not currently exist but is ranked by the survey to be less preferable than an existing facility type that has a pre-investment peak occupancy under 80% will NOT increase bicycle access ridership. Same logic as step A - a better (according to survey) bicycle parking facility is available and has available capacity. Adding capacity via a less preferred facility type should not be expected to increase bicycle access ridership.

C. Investment in a facility type with a pre-investment peak occupancy over 80% WILL increase bicycle access ridership regardless of survey ranking.

D. Investment in a facility type that does not exist in the pre-investment condition but is ranked higher than an existing pre-investment facility type WILL increase bicycle access ridership.

Note that these logic steps may sometimes result in there being NO options for the user to increase bicycle access ridership. This is intentional - bicycle parking facilities are not the limiting factor for all stations. Other factors should be analyzed to increase bicycle access ridership to these stations.

Example

TABLE 3 - SURVEY AND OCCUPANCY CHECKS		
Facility Type	Survey Ranking ¹	Pre-Investment Peak Occupancy ²
Attended bike station	1	Does Not Exist (DNE)
Electronic lockers	2	73%
Racks inside fare gates	3	DNE
Self serve bike station	4	DNE
Keyed lockers	5	DNE
Racks outside fare gates	6	40%

1. These values are pre-populated based on BART survey data when a user selects a BART station or station typology and loads default values. It is recommended that Non-BART transit agency users edit with local data.

2. These values are pre-populated based on BART observed bicycle parking occupancy data when a user selects a BART station or station typology and loads default values. All users are encouraged to edit if better data is available.

A snapshot of this station reveals that there are currently electronic lockers and racks outside the fare gates. Both are under-capacity (our threshold defined at 80%) - leading us to believe that increasing their supply would not increase ridership. Attended bike stations were the only parking type ranked higher than electronic lockers, so we can conclude that only building an attended bike station would increase ridership.

TABLE 4 - SURVEY AND OCCUPANCY CHECKS DETAILED			
Facility Type	Survey Ranking	Pre-Investment Peak Occupancy	Change in ridership with supply increase
Attended bike station	1	DNE	↑
Electronic lockers	2	73%	←
Racks inside fare gates	3	DNE	←
Self serve bike station	4	DNE	←
Keyed lockers	5	DNE	←
Racks outside fare gates	6	40%	←

Table 4 presents the application of the logic checks (A through D as presented above) to the data from Table 3. Table 4 includes a column that indicates based on the logic checks whether a hypothetical increase in supply by facility type would increase ridership. The calculations show

that only investing in attended bike stations would increase bike access ridership at this station. Please note that the "Change in ridership with supply increase" column is dynamic and will change based on the values of Survey Ranking and Pre-Investment Peak Occupancy. These values change with different BART stations and BART Station Typologies.

BART users may edit occupancy data, while non-BART users may edit both survey ranking and occupancy data. It is advised that non-BART users consider conducting a survey the scale of the one BART undertook to achieve similar results. See the Existing Conditions chapter and Appendix A for details.

Bicycle Parking Facility Supply Ceiling

The tool has established a relationship between bicycle parking facilities and ridership increases. What is not known is the limit of this relationship - how many bicycle parking spaces of a particular type can one add and still expect ridership increases? To constrain ridership increases to reasonable values, thresholds were established based on existing observed supply maximums of each facility type and best judgment. These thresholds represent the maximum observed supplies that were used to develop relationships between facility type supply and ridership increases. The relationship between facility type supply and ridership increase can be expected to hold up to the maximum observed supply but it is unknown how the relationship will change once past that maximum. Bicycle facility supply in excess above the thresholds set in Table 5 will not increase bicycle access ridership. Bicycle facility supply up to the thresholds will still increase bicycle access ridership. These thresholds are by both individual facility type and aggregated similar facility types.

TABLE 5 - BICYCLE FACILITY SUPPLY CEILING (UNITS IN BICYCLE PARKING SPACES)		
Facility Type	Individual Threshold	Aggregate Threshold
Rack spaces outside fare gates	250	275
Rack spaces inside fare gates	100	
Keyed locker spaces	40	100
Electronic lockers spaces	100	
Self serve bike station spaces	300	400
Attended bike station spaces	300	
Bike Cages	160	

Example

The individual supply ceiling for rack spaces outside the fare gates is 250. If a user inputs 350 rack spaces outside the fare gates, the tool will report increase in bicycle access ridership for 250 spaces, but costs for all 350 spaces.

The aggregate supply ceiling for locker spaces is 100. If the user inputs aggregate supply above the aggregate supply ceiling, the aggregate supply ceiling is distributed between the facilities based on the user input. If a user inputs 90 electronic locker and 30 keyed locker spaces, the tool will redistributed the user input for the purposes of ridership increase. The user inputted 120 total

spaces, while the aggregate supply ceiling is 100. For the purposes of the ridership increase calculation, the tool will distribute the ceiling (100) to the facility types based on the user input. In this example, 75% of the user input (90/120) was electronic lockers and 25% of the user inputs (30/120) was keyed lockers. Thus the tool will use 75 electronic lockers (75% of 100) and 25 keyed lockers (25% of 100) for input into the model.

Thus if a user inputs 90 electronic locker and 30 keyed locker spaces, the tool will report increase in bicycle access ridership for 75 electronic locker and 25 keyed locker spaces, but costs for 90 electronic locker and 30 keyed locker spaces.

Bicycle Parking Facility Diminishing Returns on Increased Ridership

According to a comprehensive bicycle parking inventory conducted during the development of this plan, stations with the largest supply of a given facility type have lower observed occupancy rates of the over-supplied facility type than stations with more modest supplies of that parking type. As a conservative estimate, this tool incorporates diminishing returns for bicycle parking facilities as they approach their individual supply ceilings (see Table 5 above). As the scenario investments reach the ceiling, the ridership increase for each facility type unit decreases. Table 6 shows the diminishing return relationship by supply range. Please note that these calculations happen for all bicycle parking facility types separately.

TABLE 6 - INCREASED BICYCLE PARKING FACILITIES INCUR DIMINISHING RIDERSHIP RETURNS (FOR FACILITY TYPES SEPARATELY)	
Supply range (the difference between existing supply and individual ceiling)	Percentage of full relationship
1st 25%	100%
2nd 25%	75%
3rd 25%	50%
4th 25%	25%

Example

Please note that these calculations happen for all facility types separately. The example below just shows the calculation for rack spaces outside the fare gates.

A station has 50 existing rack spaces outside the fare gates. The user inputs 125 rack spaces outside the fare gates to be installed for its chosen scenario. The difference between the existing supply and the individual ceiling is 200. (Individual ceiling for rack spaces outside fare gates of 250 and 50 existing spaces). The difference between the existing supply and the individual ceiling is then split into supply ranges for diminishing return calculations (Table 7).

TABLE 7 - DIMINISHING RETURNS SETUP FOR RACKS
--

OUTSIDE FARE GATES ¹	
Scenario supply range	Percentage of full relation
0-50	100%
51-100	75%
101-150	50%
151-200	25%
1. Example shown for racks outside fare gates only. These calculations happen for all facility types.	

The user inputs 125 rack spaces outside the fare gates. The following calculations determine total bicycle access ridership increase including diminishing returns if we assume that the relationship between a bicycle rack space and bicycle access ridership is 1 (for demonstration only).

TABLE 8 - DIMINISHING RETURNS CALCULATIONS FOR RACKS OUTSIDE FARE GATES ¹			
Scenario supply range	Scenario supply in range	Percentage of full relation.	Ridership increase
0-50	50	100%	50.0
51-100	50	75%	37.5
101-150	25	50%	12.5
151-200	0	25%	0.0
Total	125		100.0
1. Example shown for racks outside fare gates only. These calculations happen for all facility types.			

The total bicycle access ridership increase is calculated to be 100 with the effects of diminishing returns. The total bicycle access ridership would have been calculated to be 125 without the effects of diminishing returns.


TOOL WALKTHROUGH

This section provides a general overview of the contents of the BART Bicycle Investment Tool. Please refer to the tool for detailed instructions, which are provided in the Tool as blue boxes like the following:

Blue boxes include instructions and definitions

Instructions

The instructions tab contains a table of contents and disclaimers on using the tool.

Bicycle Investment Tool

Step 1A - Instructions

Blue boxes include instructions and definitions

Table of contents	
Step 1	Introduction
Step 1A	Instructions
Step 1B	Assumptions and Constraints
Select Bicycle Parking Investments	
Step 2	Bicycle Parking Investments
Step 2A	Bicycle Parking Investments Input
Step 2B	Bicycle Parking Investments Summary
Select Bicycle Access Support Strategies	
Step 3	Support Strategies
Step 3A	Cyclist Circulation Strategies
Step 3B	Plentiful Parking Strategies
Step 3C	Beyond BART Boundaries Strategies
Step 3D	Bikes on BART Strategies
Step 3E	Persuasive Programs Strategies
Review Investments and Strategies	
Step 4	Overall Summary

Read Disclaimers before using tool!

Disclaimers	
This tool was based on BART ridership and stated preference survey data.	
This tool has been designed for other transit operators to use.	
It is recommended that other transit operators validate and calibrate the tool to match their local conditions before using for official planning documents.	
For help in calibration and validation please contact the project sponsors:	
BART title	Steve Beroldo sberold@bart.gov
Caltrans title	Caltrans contact cal.trans@dot.ca.gov

For best results view the tool in resolution 1280x1024 or higher.
This tool was designed for Microsoft Excel 2007 and 2010.
This tool will not work with earlier versions of Excel.

You must enable macros and ActiveX before using the tool.
Follow the instructions on the following links before continuing.

[Enable Macros](#)
[Enable ActiveX](#)

If you are having trouble publishing to PDF see the following link
[2007 Microsoft Office Help: Save as PDF](#)

Printable

Printable

Version 1.0 - Release date March 2012. Developed by Fehr & Peers, Transportation Consultants.
Developed by Mackenzie Watten and Brooke DuBose.
[Contact Fehr & Peers for troubleshooting or general feedback](#)

Assumptions and Constraints

This page mirrors the assumptions and constraints discussion from this document.

Bicycle Investment Tool																									
Step 1B - Assumptions and Constraints																									
1. Bicycle Access Mode Share																									
1.1 Calculation of Bicycle Access Mode Share																									
<p>Bicycle access mode share is calculated to be consistent with the BART Bicycle Plan bicycle access mode share goals. The data used to develop the tool did not indicate whether the increase in bicycle access riders would be those who already ride BART and shift modes or those entirely new to the BART system. The decision was made to assume that all new bicycle access riders would be considered new to the BART system. This is a conservative approach in terms of estimating bicycle access ridership but is not conservative in terms of estimating BART revenue. This tool is focused with the former.</p> <p>Example: A station has 4,500 total station access riders and 225 bicycle access riders in pre-investment conditions for a bicycle access mode share of 5%. The tool identifies 50 new bicycle access riders due to bicycle parking investments. There are now 4,550 total station access riders and 275 bicycle access riders at the station for a bicycle access mode share of 6%.</p> <p>Tool Implementation: Mode share is calculated for each scenario as described above and presented on graph 2.3 on the "Bicycle Parking Invest. Summary" tab along with the corresponding number of bicycle access riders and total station riders.</p>																									
1.2 Bicycle Access Mode Share Ceiling																									
<p>As a check on the tool, mode shares are prohibited from going above set ceilings. These ceilings were based on existing observed maximum of mode share. A buffer of 3 percentage points was added to each of the highest observed mode share to allow for some growth at the highest mode share stations. Table 1.2 shows the final ceilings.</p> <p>Tool Implementation: Graph 2.3 on the "Bicycle Parking Invest. Summary" tab graphical represents mode share, including the maximum allowed for your station.</p>																									
<table border="1"> <caption>Table 1.2 - Bicycle Access Mode Share Ceiling by Station Typology</caption> <thead> <tr> <th>Station Typology</th> <th>2008 Max Station</th> <th>2008 Max Mode Share</th> <th>Tool Max Mode Share</th> </tr> </thead> <tbody> <tr> <td>Urban</td> <td>16th Street / Mission</td> <td>5.7%</td> <td>8.7%</td> </tr> <tr> <td>Urban with parking</td> <td>Ashby</td> <td>11.3%</td> <td>14.3%</td> </tr> <tr> <td>Balanced Intermodal</td> <td>Fruitvale</td> <td>9.8%</td> <td>12.8%</td> </tr> <tr> <td>Intermodal / Auto Reliant</td> <td>West Oakland</td> <td>5.4%</td> <td>8.4%</td> </tr> <tr> <td>Auto Dependent</td> <td>Pleasant Hill</td> <td>5.2%</td> <td>8.2%</td> </tr> </tbody> </table>		Station Typology	2008 Max Station	2008 Max Mode Share	Tool Max Mode Share	Urban	16th Street / Mission	5.7%	8.7%	Urban with parking	Ashby	11.3%	14.3%	Balanced Intermodal	Fruitvale	9.8%	12.8%	Intermodal / Auto Reliant	West Oakland	5.4%	8.4%	Auto Dependent	Pleasant Hill	5.2%	8.2%
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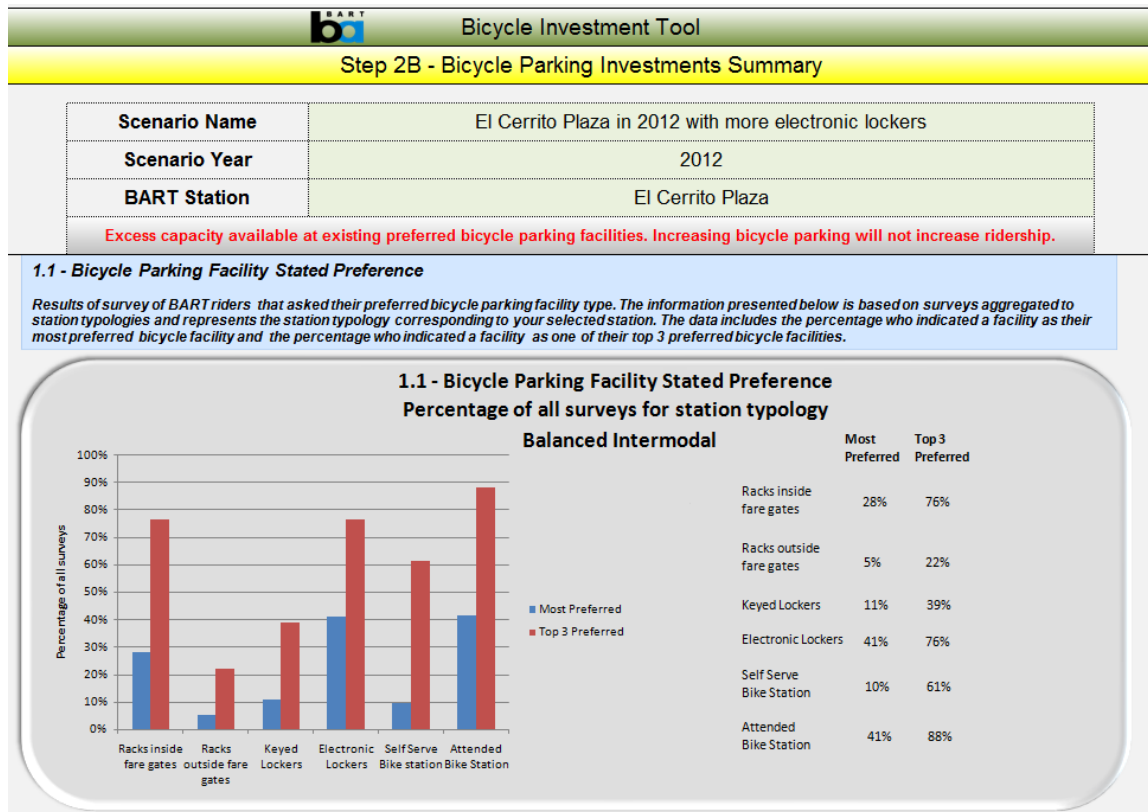
Bicycle Parking Invest. Input

Bicycle Parking Investment Input is the location where the user can input their scenario specific investments. Together with the next tab, 'Bicycle Parking Investment Summary,' the user can put together an investment scenario that meets their station's needs.

Bicycle Investment Tool					
Step 2A - Bicycle Parking Investments Input					
Input scenario information					
1 Scenario Name	El Cerrito Plaza in 2012 with more electronic lockers				
2 Choose Scenario Year	2012 ▲ ▼ <i>Choose a year between 2012 and 2020 to populate information about station area characteristics</i>				
3 Total Budget	<table border="1"> <tr> <td>Capital</td> <td>\$25,000</td> </tr> <tr> <td>Annual Operating</td> <td>\$1,500</td> </tr> </table> <i>Enter total budget to compare against chosen investments costs. These budgets refer only to the new investments.</i>	Capital	\$25,000	Annual Operating	\$1,500
Capital	\$25,000				
Annual Operating	\$1,500				
4 What station are you analyzing?	<input type="radio"/> BART Station <input checked="" type="radio"/> Non-BART Station <i>BART Station - Uses station area characteristics from one of the 44 BART stations. Continue to step 5A Non-BART Station - Uses station area characteristics from one of five station typologies that represent range of BART stations. The tool is based on BART data. Tool may be transferrable to similar operators but validation of tool to local conditions is recommended before use. Continue to step 5B</i>				
5B BART Station Typology selection	Balanced Intermodal <i>Choose from one of the five BART Station typologies and continue to steps 6 and 6B.</i> <i>Auto Dependent: Focus on auto-based access. Large station footprint, structured and/or surface auto parking, and adjacent highway access. Walk and transit access share predominantly below average. BART examples include East Dublin/Pleasanton, Lafayette, and Pittsburg/Bay Point.</i> <i>Intermodal / Auto Reliant: Well-served by regional and local transit. Large amounts of auto parking provided. Can be found on suburban grid or in residential area. Walk access share is lower than average. BART examples include Daly City, El Cerrito Del Norte, and Walnut Creek.</i> <i>Balanced Intermodal: Well-served by transit that serves primarily corridor and local transit. Auto parking provided, but fills early due to size. Can be found on urban or suburban grid network. Walk access share is moderate. BART examples include Fruitvale, MacArthur, and Rockridge.</i> <i>Urban with Parking: Similar to "Urban", but with small auto parking lots that fill up early. Auto mode share is higher than "Urban" stations. BART examples include Ashby, Lake Merritt, North Berkeley, and Glen Park.</i> <i>Urban: High ridership with high walk, bike, and transit access share. No auto parking provided. Can be found in downtown or neighborhood business district. BART examples include 12th Street Oakland, Downtown Berkeley, and Embarcadero.</i>				
5B					

Bicycle Parking Invest. Summary (Printable!)

The Bicycle Parking Investment Summary tab contains information to review before and after the user chooses their investments. The information helps guide the user to investments that will serve the needs of their station.




This page is printable to a printer or PDF. The page is formatted to print in two pages and can be a handy reference guide.

Print Bicycle Parking Investment Summary Page

Publish Bicycle Parking Investment Summary Page to PDF

Support Strategies

In addition to bicycle parking facility investments, complementary strategies can be selected to put together a complete planning package. Note that the cost and potential increase in bicycle access ridership associated with these strategies is unknown. It is the hope that future iterations of this tool will incorporate costs and benefits for these strategies.

 Bicycle Investment Tool		
Step 3 - Support Strategies		
<i>Note that there are not increases in ridership or costs associated with these strategies.</i>		
Step 3A - Cyclist Circulation Strategies		
Strategy	Include?	Scope
High Priority		
Develop and install wayfinding signage	<input checked="" type="checkbox"/>	Station
Optimize routes between surrounding network and fare gates	<input checked="" type="checkbox"/>	Station
Evaluate and install stairway channels	<input checked="" type="checkbox"/>	Station
Revisit bicycles on escalators policy	<input checked="" type="checkbox"/>	Systemwide
Clean elevators regularly	<input checked="" type="checkbox"/>	Station
Medium Priority		
Install additional ADA-accessible fare gates	<input checked="" type="checkbox"/>	Station
Low Priority		
Install ADA-accessible fare gates adjacent to elevators	<input checked="" type="checkbox"/>	Station
Step 3B - Plentiful Parking Strategies		
Strategy	Include?	Scope
High Priority		
Provide adequate bicycle parking of each type	<input checked="" type="checkbox"/>	Station
Light all bike parking areas	<input checked="" type="checkbox"/>	Station
Maintain bicycle facilities more frequently	<input checked="" type="checkbox"/>	Station
Allow Clipper payment for bike parking	<input checked="" type="checkbox"/>	Station
Medium Priority		
Manage eLocker demand through price variation	<input checked="" type="checkbox"/>	Station
Low Priority		

Overall Summary (Printable!)

The Overall Summary tab contains information from all of the previous tabs. The page is formatted to print out an easy-to-digest three-page handout, which presents comparisons between the chosen bicycle investment package and typical BART vehicle parking investments at stations.

Bicycle Investment Tool					
Step 8 - Overall Summary					
Scenario Name	El Cerrito Plaza in 2012 with more electronic lockers				
Scenario Year	2012				
BART Station	El Cerrito Plaza				
Excess capacity available at existing preferred bicycle parking facilities. Increasing bicycle parking will not increase ridership.					
1. Bicycle parking investment summary					
Summary of chosen bicycle parking investments and their costs and influences on ridership.					
These costs are then compared against automobile parking investments.					
Investment	Units	Bike Parking Spaces	Capital Cost	Annual Operating Cost	Daily Bike Access Ridership Increase
Electronic lockers	13	52	\$136,500	\$5,200	0
Bicycle Parking Investments	13	52	\$136,500	\$5,200	0
Budget			\$25,000	\$1,500	
Balance			\$111,500	\$3,700	
			Pre-Investment	Scenario	Goal
Daily Bike Access Ridership			288	288	396
Daily Bike Access Mode Share			6.4%	6.4%	8.6%
Investment Type	Capital + annual operating cost per new daily rider				
Bicycle Parking Investments	N/A				
Auto parking investments (surface parking)	\$7,700				
Auto parking investments (structure parking)	\$41,900				

This page is printable to a printer or PDF. The page is formatted to print in three pages and can be a handy reference guide.

Print Bicycle Parking Investment Summary Page	Publish Bicycle Parking Investment Summary Page to PDF
Print Overall Summary Page	Publish Overall Summary Page to PDF

This release of the tool represents version 1.0. The tool was developed by Fehr & Peers, Transportation Consultants. The tool was developed by Mackenzie Watten and Brooke DuBose. Please [contact Fehr & Peers](#) for troubleshooting or general feedback.

I | Investment Tool Development History

The memorandum beginning on the following page describes the adaptation of BART's Direct Ridership Model (DRM) to forecast bicycle access. This model provides the basis for the Bicycle Investment Tool described in chapter 4.

MEMORANDUM

Date: February 22, 2012

To: Steve Beroldo, BART

From: Mackenzie Watten and Brooke DuBose, Fehr & Peers

Subject: *BART Bicycle Access Plan Update – BART Bicycle Direct Ridership Model Development*

SF11-0545

This memorandum describes the development of a Direct Ridership Model (DRM) for the BART Bicycle Access Plan Update¹. The purpose of the model is to predict changes in BART bicycle access ridership by station based on station area variables, including both the physical environment and BART bicycle policies. The model is designed to rate the efficiency (measured in passengers per dollar of investment) of various investments on ridership. The development of a bicycle specific BART DRM follows the successful development of an aggregate ridership BART DRM in 2009. That model estimates total ridership at each BART station and then splits the ridership into auto, transit, and combined walk and bicycle access modes. The aggregate model is used internally at BART for ridership and operation forecasting.

The aggregate ridership BART DRM was not developed to estimate bicycle ridership. Walk and bicycle ridership were combined; the only bicycle-specific variable in the model was the total number of bicycle parking spaces systemwide. The bicycle specific BART DRM for the BART Bicycle Access Plan Update estimates bicycle ridership based on a number of station area variables, including bicycle related variables. Variables include nearby population, nearby employment, vehicle parking, supply of bicycle parking, security and lighting of bicycle parking, BART bicycle policies, and station typology. The model predicts the number of BART riders accessing each station by bicycle each weekday. The model was developed based on BART specific data but is also generalized to five station typologies so that it may be used by transit agencies other than BART. The station typologies – Urban, Urban with Parking, Balanced Intermodal, Intermodal-Auto Reliant, and Auto Dependent – are used by BART for other planning purposes as well. See the *BART Bicycle Investment Tool User's Guide* dated February 22, 2012 for a detailed description of each station typology.

The bicycle specific BART DRM is implemented within the BART Bicycle Investment Tool that gives the user the ability to evaluate bicycle investments at a station or system-wide level. This model is an innovative tool that will serve as a template for other transit agencies to customize and improve upon.

¹ This memorandum is accompanied by the BART Bicycle Investment Tool User's Guide, dated February 22, 2012. The BART Bicycle Investment Tool is a Microsoft Excel based tool that uses the BART Bicycle Direct Ridership Model results to identify the most cost-effective bicycle investments in terms of their ability to encourage the use of bicycles as a mode of travel to and/or from BART.

WHAT IS A DIRECT RIDERSHIP MODEL?

Direct Ridership Models transparently estimate transit ridership as a function of station area characteristics. Traditional forecasting of transit ridership within region-wide travel demand models is unresponsive to changes in station-level land use or transit service characteristics, and is buried within a complicated black box. Direct Ridership Models establish clear relationships between transit ridership and station area characteristics. For example, a DRM may estimate that transit ridership at a heavy rail station is a function of population within five miles of the station, the amount of vehicle parking at the station, and the frequency of feeder transit to the station. The DRM model estimates the influence that each station area characteristic has on transit ridership. This magnitude of influence could then be applied to stations similar to the ones used to develop the DRM.

Direct Ridership Models use multivariate regression and other statistical analyses based on local empirical data to determine the station characteristics that most influence transit patronage. These models can respond directly to factors such as station-area household and employment characteristics, vehicle and bicycle parking, feeder transit activity, street network connectivity, and the effects of transit-oriented development (TOD). Direct Ridership Models are a more efficient and responsive means of forecasting the effects of individual station activities than conventional transit patronage models. Transit ridership is traditionally forecast with region-wide travel demand models, which often represent transportation networks and land use at an aggregate scale. Such models are relatively unresponsive to changes in station-level land use and transit service characteristics. Even rarer than traditional transit ridership models are models that forecast bicycle access to rail transit.

The DRMs developed for this study predict changes in weekday bicycle access ridership at individual BART stations, based on empirical relationships found through statistical analysis of BART system ridership data, the 2008 BART Passenger Profile Survey, and the 2011 online BART Bicycle Access Survey. This is a first-of-its-kind bicycle access to transit model.

MODEL DEVELOPMENT PROCESS

The objective of developing a bicycle-specific model is to derive a series of statistically valid models capable of predicting current weekday station-specific bicycle ridership. The models are capable of responding to input changes, and are therefore able to predict changes to future bicycle access ridership.

Daily boarding models were developed for two types of bicycle access: park and ride (P&R) and board with bike (BwB). The sample sizes for P&R and BwB users from the data used to derive the models were small. In statistics, relationships between data become more accurate as more data is available for the model derivation process. To increase the accuracy of the relationships derived, the models were developed for total weekday ridership instead of for smaller time periods.

The P&R and BwB data is from the 2008 BART passenger profile survey. The survey responses included the boarding station and the mode of access to each station. BART also supplied raw ridership data from the same days on which the survey was taken. Average boardings by mode were developed from the ridership data.

Station area data was collected for 33 independent variables believed to be potentially predictive of station bicycle ridership. All of the data, with the exception of bicycle parking, street network

connectivity, and BART bicycle policy, was collected in 2008 as part of the aggregate ridership BART DRM. Additional data was collected in 2011. These variables roughly break into ten categories, as shown in Table 1.

TABLE 1 POTENTIALLY PREDICTIVE VARIABLES FOR THE BICYCLE-SPECIFIC DRM		
Category	Description	Source
Population	Population within ½ mile of station	Regional travel demand models
	Catchment population	
	College population	
Employment	Retail employment within ½ mile of station	Regional travel demand models
	Non-retail employment within ½ mile of station	
Demographic	Average household income	BART Online Survey (2011)
	Average age	
Parking (Automobile)	Unreserved vehicle parking at station	Field data collection (2008)
	Reserved vehicle parking at station	
Parking (Bicycle)	Bicycle racks outside fare gates	Field data collection (2011)
	Bicycle racks inside fare gates	
	Keyed lockers	
	Electronic lockers	
	Self Serve bike station spaces	
	Attended bike station spaces	
Street Network Connectivity	Station pedestrian accessibility and design factor	Field data collection (2008) and Barajas (2011)
	Street network density	
	Intersection density	
	Connected node ratio	
	Link ratio	
Feeder Transit Service	Local buses	Regional transit agencies (2008)
	Express buses	
	Employer/College shuttles	
	Rail/ferry connections	
Bicycle Survey Data	Security of bike parking	BART Online Survey (2011)
	Lighting of bike parking	
	Signage to bike parking	

**TABLE 1
POTENTIALLY PREDICTIVE VARIABLES FOR THE BICYCLE-SPECIFIC DRM**

Category	Description	Source
	Bike pathways to station	
	Street level to bike parking	
	Street level to platform	
BART bicycle policy	Blackout periods by station	BART
Station Typology	Representative station descriptions for transferability	<i>Access BART</i> , Arup (2006)

Source: Fehr & Peers, 2012.

Population and Employment

Station-related population, housing, and employment data within a half-mile radius of the BART station was developed as part of the 2008 aggregate ridership BART DRM. The data was derived with Travel Analysis Zone (TAZ) data from several regional travel demand models, including the following:

- Alameda County Transportation Commission (Alameda CTC) model
- Contra Costa Transportation Authority (CCTA) model
- San Francisco County Transportation Authority (SFCTA) CHAMP3 model
- Metropolitan Transportation Commission (MTC) model for San Mateo County²

The versions available for all of these models at the time of the beginning of the study used *ABAG Projections 2005* for their land use data. For each station, a set of demand model TAZs was defined from which to include land uses. For TAZs entirely within a half-mile radius from the centroid of BART stations, all of the land use was included in the station-related data. In cases where part of the TAZs was within a half-mile radius, aerial maps were examined to determine appropriate percentages of the residential and non-residential uses within each TAZ to include in the station-related data.

The extensive effort necessary to determine station area land use based on local TAZs made it possible to analyze only one radius length around each station. The half-mile was chosen, as opposed to the quarter-mile or some other distance, because it corresponds roughly to what is considered walking distance for most people, and because it has proven to be explanatory in past BART direct ridership modeling efforts, such as *Access BART* (2006). While it is beyond the scope of this project to revise that station area land use, future revisions of the bicycle model could include a distance more congruent with average bicycle trip lengths.

² San Mateo County does not have a recent travel demand model with greater detail than the MTC TAZ system.

Demographics

Average household income and age were collected from the 2011 online BART Bicycle Access Survey.

Vehicle Parking

Vehicle parking data was collected as part of the 2008 aggregate ridership BART DRM. On-site parking supply was provided by BART staff, which contained information on total number of each type (free, reserved, paid, carpool, and midday) of spaces.

Bicycle Parking

Bicycle parking at all BART stations was inventoried for supply and occupancy in the spring of 2011. For each station, parking and occupancy were catalogued by type and location (in relation to the fare gates).

Street Network Connectivity

Street network connectivity measures were gathered from *Built Environment and Demographic Predictors of Bicycle Access to Transit*, Jesus Miguel Barajas, 2011. Barajas used the 2008 TIGER/Line Shapefile set from the U.S. Census Bureau to calculate the connectivity variables. Street network density is the linear length of roads per unit area. Intersection density is the number of intersections per unit area. The unit area of analysis for the report was a one mile buffer.

Feeder Transit Service

Feeder transit frequency data was collected as part of the 2008 aggregate ridership BART DRM. The data indicates the number of individual feeder transit services that access each station daily. Feeder transit include local buses, express buses and shuttles, employer / college shuttles, and connection rail or ferries.

BART bicycle policy

The percentage of daily trains that are blacked out by station was determined using the BART schedule in the spring of 2011.

Station Typology

Station typologies were identified in the *Access BART* report, Arup, 2006.

Airport stations (SFO and the future Oakland Airport Connector station) were excluded from the regression equations, because of the unique station area land uses and factors which influence ridership at those stations. The West Dublin station was excluded from the regression equations because it was not operational at the time of the 2008 station survey.

DESCRIPTION OF DIRECT RIDERSHIP MODELS

The variables chosen to be part of the final models are those listed in Table 1 that were found to be statistically significant – that is they statistically “explain” a portion of the dependent variable

(bicycle access ridership). See Table 2 for the variables shown to be significant in predicting bicycle ridership, and Table 3 for those predictive of P&R. Of those variables not found to be significant, some should perhaps be pursued for the following reasons:

- Demographics: Online survey data was used for this variable. Actual demographic data from the U.S. Census could yield a different outcome.
- Street network connectivity: Although this variable was not shown to influence bicycle ridership, perhaps bicycle network connectivity would. It is outside of the scope of this project to collect this data, but future model refinement should consider it.

The mathematical form of each model is a regression formula, with each model incorporating a subset of the variables listed in Table 1.

Two models were developed to predict P&R and BwB models. To produce the most accurate and flexible results, models were developed to first estimate total bicycle access ridership and then estimate the percentage of that total bicycle access ridership that is P&R bicycle access ridership. The difference between the total and P&R bicycle access ridership is then the estimated BwB bicycle access ridership.

Table 2 presents the total bicycle access ridership model.

TABLE 2 TOTAL BICYCLE ACCESS RIDERSHIP MODEL	
Dependent Variable	-
Total Bicycle Access Ridership	-
Independent Variables	Coefficient
Population within ½ mile	0.015729
Unreserved Parking Spaces	-0.058559
Non-Blackout Percentage of Daily Trains	74.463000
Self-Service Bike Station Spaces	1.81319
Attended Bike Station Spaces	1.91460
Bike Rack Spaces	1.19245
Locker Spaces (keyed & eLocker)	1.33364
Source: Fehr & Peers, 2012.	

The form of this model is

$$\begin{aligned}
 \text{Total Bicycle Access Ridership} = & 0.015729 \times \text{Population Within Half Mile} \\
 & - 0.058559 \times \text{Unreserved Parking Spaces at Station} \\
 & + 74.463 \times \text{NonBlackout Percentage of Daily Trains at Station} \\
 & + 0.181319 \times \text{Self - Service Bike Station Spaces} \\
 & + 0.19160 \times \text{Attended Bike Station Spaces} \\
 & + 0.119246 \times \text{Total Rack Spaces} \\
 & + 0.133364 \times \text{Total Locker Spaces}
 \end{aligned}$$

This model has seven independent variables, which can be interpreted as follows:

- Bicycle access ridership increases as population within half mile of the station increases
- Bicycle access ridership decreases as more unreserved vehicle parking spaces are provided
- Bicycle access ridership increases as the non-blackout percentage of daily trains increases
- Bicycle access ridership increases as the number of self-service bike station spaces increases
- Bicycle access ridership increases as the number of attended bike station spaces increases
- Bicycle access ridership increases as the number of total rack spaces increases
- Bicycle access ridership increases as the number of total locker spaces increases

Table 3 presents the percentage of total bicycle access that is P&R model. This model was developed using the natural logarithm form of the bicycle access ridership that is P&R. The natural logarithm form of the dependent variable helped to flatten out some of the extreme values and created a better performing model.

TABLE 3 PERCENTAGE OF TOTAL BICYCLE ACCESS RIDERSHIP THAT IS P&R MODEL	
Dependent Variable	-
Log of P&R Share	-
Independent Variables	Coefficient
Non-Blackout Percentage of Daily Trains	-3.138000
Total Bicycle Parking Spaces	0.002193
Security of Bicycle Parking	0.647000
Lighting of Bicycle Parking	0.323000
Station Type (1-5, Urban-Auto Dependent)	0.192000
Source: Fehr & Peers, 2012.	

While this model is based on the log form of P&R share, the same linear intuition applies. Larger numbers have more influence and positive coefficients meaning a positive correlation. The application of the model differs slightly. It is a two step process. It takes the form of:

$$\begin{aligned}
 LN(Park\ and\ Ride\ Share) = & -3.138 \times \text{NonBlackout Percentage of Daily Trains at Station} \\
 & + 0.002193 \times \text{Total Bicycle Parking Spaces} \\
 & + 0.647 \times \text{Security of Bicycle Parking Ranking} \\
 & + 0.323 \times \text{Lighting of Bicycle Parking Ranking} \\
 & + 0.192 \times \text{Station Type}
 \end{aligned}$$

This model has five independent variables, which can be interpreted as follows:

- Park and ride share of total bicycle access ridership decreases as blackout periods are eliminated

- Park and ride share of total bicycle access ridership increases as bicycle parking spaces increases
- Park and ride share of total bicycle access ridership increases as security and lighting of bicycle parking increases
- Park and ride share of total bicycle access ridership is higher at suburban stations as compared to urban stations

Once the log of P&R share is calculated, the value can be converted to actual P&R share by the following equation

$$\text{Park and Ride Share} = e^{\ln \text{Park and Ride Share}} / (e^{\ln \text{Park and Ride Share}} + 1)$$

ADJUSTMENTS TO REGRESSION MODELS

The previous section detailed the statistical relationships between the dependent variable (bicycle access ridership) and independent variables (BART station area and policy variables). The relationships derived produce reasonably-well performing models that connect bicycle access ridership with factors believed to influence to bicycle access ridership.

Further improvements to the model's performance will need to rely on best practices and professional judgment. This section describes potential adjustments that could be made to the bicycle access ridership model to improve the use of the model as inputs into the investment scenario planning tool. The justification for adjusting the model is based on three factors:

- **Best Practices** – The relationships derived from the models would recommend investments that do not necessarily agree with industry best practices for bicycle parking. For example, the model results would not necessarily suggest a mix of short- and long-term parking facilities.
- **Limitations of Existing Data** – The relationships were derived using data that may have been incomplete or inconclusive in terms of existing infrastructure. For example, the Downtown Berkeley and Ashby Bike Stations are relatively new and current demand may not yet have reached its potential. It is anticipated that use will increase as passengers learn about these facilities.
- **Unknown or New Types of Investments** – The relationships derived do not include any factors to predict the effect of facilities with which BART does not already have experience. For example, there is no existing data on bike cages at BART stations, though BART may want to evaluate these and other facility types in the Investment Tool.

Ultimately, a balance must be struck between the statistically derived relationships and making the model useful and flexible for evaluating future investments; however, moving away from the statistically derived relationships will decrease overall model performance.

Table 4 presents the list of bicycle investments the model is currently being designed to evaluate, the influence of each as measured by purely statistical modeling, the adjusted influence as modified with professional judgment and supporting data and literature, and the justification of the adjustment.

**TABLE 4
BICYCLE INVESTMENT INFLUENCE ADJUSTMENT**

Model variable	Influence as measured by statistics	Adjusted influence	Justification
Total bicycle access ridership			
Population within ½ mile	0.015729	-	-
Unreserved Vehicle Parking Spaces	-0.058559	-	-
Non-Blackout Percentage of Daily Trains	74.463000	-	-
Self-Service Bike Station Spaces	1.81319	2.0	Existing occupancy data from relatively new bike stations may not accurately capture total potential demand (+0.2)
Attended Bike Station Spaces	1.91460	2.4	Existing occupancy data from relatively new bike stations may not accurately capture total potential demand (0.2). Other amenities such as repairs, tools, information and bike shop may also attract bicyclists (+0.3)
Bike Rack Spaces Inside Fare Gates	1.19245	1.3	The model does not account for perception of security; would expect to have higher influence than racks outside fare gates (+0.1)
Bike Rack Spaces Outside Fare Gates	1.19245	1.1	The model does not account for perception of security; would expect to have lower influence than racks outside fare gates (-0.1)
E-Locker Spaces	1.33364	-	-
Keyed Locker Spaces	1.33364	1.0	Keyed locker systems support very few users per unit of investment.
New Factor Y (example: bike cage)	N/A	2.0	Would anticipate similar level of influence as self-service bike station.
Source: Fehr & Peers, 2012.			

MODEL VALIDATION

The following section details the validation of the statistically based and adjusted bicycle DRMs. This step evaluates the estimates of ridership from the DRM as compared to 2008 ridership data as well as measures of the statistical significance of the estimated model.

R-Squared

The R-squared indicator expresses how close the model comes to explaining all of the station-to-station variability in the dependent variable. For example, a perfect R-squared value of 1.0 indicates the variation in bicycle ridership among all BART stations is fully described by the model's combination of independent variables (population, employment, etc.) and their respective coefficients and constant term. It is possible to have a negative R-squared.

Percent Root Mean Squared Error (%RMSE)

The formula for %RMSE is

$$\frac{\sqrt{\sum (x_i - y_i)^2 / n}}{\sum y_i / n}$$

where x represents model predictions, y represents actual ridership, the 'i' subscripts refer to each individual station, and n is the total number of stations.

The %RMSE is an alternate measure to R-squared, which captures the same general effects, but in this case a lower value corresponds to a better model fit. Therefore, %RMSE values are inversely correlated with R-squared values; the models with the highest R-Squared generally had the lowest RMSE, and vice versa. RMSE values below 40% are generally considered good for transportation studies. Both model performance indicators (R-squared and percent RMSE) are presented in Table 3. Only the total bicycle access model (i.e., Park and Ride and Board with Bike combined) shows an RMSE under the 40% threshold. Interestingly, the non-adjusted P&R model has an identical R-squared as the combined model, although the adjusted total and P&R models show a small discrepancy. The models have an R-squared higher than 0.61, meaning more than 61% of the station-to-station variation in ridership is explained by the models' variables. While the R-squared values could stand to be higher, the models did indicate significant influences between the independent variables (station area variables and BART policies) and the dependent variable (bicycle access ridership).

TABLE 3 MODEL PERFORMANCE		
Model	R-Squared	RMSE
Total Bicycle Access Ridership		
<i>Non-Adjusted</i>		
All Stations	0.79	35%
<i>Adjusted</i>		
All Stations	0.76	37%
Park and Ride (P&R) Bicycle Access Ridership		
<i>Non-Adjusted</i>		
All Stations	0.79	46%
<i>Adjusted</i>		
All Stations	0.72	53%
Board with Bike (BwB) Bicycle Access Ridership		
<i>Non-Adjusted</i>		
All Stations	0.62	47%
<i>Adjusted</i>		
All Stations	0.61	47%
Source: Fehr & Peers, 2012.		

NEXT STEPS

The BART bicycle DRM can be used to determine the efficiency of different station or system-wide strategies to increase bicycle ridership to transit. Combined with cost estimates for the various strategies, the DRM will be used as an investment scenario tool to evaluate the costs and benefits of bicycle access improvements at stations. While the DRM was developed using BART specific data, BART station typologies allow for the tool to be easily transferrable to other heavy rail transit operators. Other transit agencies with “station-like” infrastructure, such as light rail, commuter rail, or BRT may also be able to use this model. It is advised that all parties who wish to use this model perform a local validation of the model to their own bicycle access ridership to ensure that the model performs adequately for their situation.

This model represents one of the first attempts to estimate bicycle access to transit. As a pioneer, there were limitations in the quantity and quality of data needed for model development. Further refinements and enhancements of the model will be necessary to improve performance. The following steps should be considered during the next Bike Plan update, BART aggregate DRM update, or at a later date.

Update existing data

The BART Bicycle Investment Tool, which incorporates the BART Bicycle DRM, uses bicycle parking facility stated preference survey and bicycle parking occupancy data to help constrain the

outputs of the BART Bicycle DRM. Bicycle parking facility stated preference data should be included in the next BART Passenger Survey in addition to adding bicycle focused questions from the 2011 online survey conducted as part of this project. Detailed bicycle parking occupancy data should be collected by time of year, week, and day. The data collected for this project was limited to one observation at mid-day (assumed peak occupancy) at each station.

The bicycle parking facility stated preference data should be compared to the observed preference data (bicycle parking occupancy data) to ensure that there is no stated bias.

Evaluate model performance

Before and after studies of BART bicycle investments and policy changes should be performed to compare against relationships established by the BART Bicycle DRM. In addition, review of before and after studies from other similar transit agencies should be conducted. Efforts should be made to track and review other efforts to model bike access to transit.

Incorporate new data sources

As a first-of-its-kind bicycle access to transit model, there were limitations in the quantity and quality of data needed for model development. Certain variables were shown to not be significant in estimating bicycle access ridership when it was expected they would be. Street network connectivity, bicycle network connectivity, and physical space constraints at stations should be explored for inclusion in future iterations of the model.

Existing data on bike stations is limited. Carefully review new data concerning bike stations as users become more familiar and comfortable with them.

Data on bicycle parking facilities that do not currently exist at BART stations should be explored. Examples include bike share, bike cages, and stair channels. Other technologies may emerge in the future that should be included for consideration.

Expand Bike Model

The bike model represents the first iteration of a model that will evolve over time. As the model is used there may be different requests for functionality to be built into the model. The following represents the current ideas for evolution of the model

- Bike egress model
 - The current model is for bike access only. Consider adding an egress model
- Increase catchment area variables (such as population, employment) beyond ½ mile radii
 - Expand the catchment area variables to a radii more consistent with appropriate bike access catchment area
- Understanding mode shifts
 - Distinction between attracting new riders versus retaining existing riders
 - Distinction between attracting new riders to BART system versus shifting of existing BART riders from other modes
 - Current model assumes all increases in bike access ridership are new riders to the BART system. This is a conservative estimate in terms of bicycle mode share but not conservative in terms of BART revenue
- Connect BART Bicycle DRM to BART Aggregate DRM
 - Perhaps as part of next BART Aggregate DRM development

APPENDIX A

Significance level of variables and intercept

The following tables show the parameter and significance level for each independent variable and intercept for each of the models highlighted above.

Total Bicycle Access Ridership

TABLE A-1 TOTAL BICYCLE ACCESS RIDERSHIP MODEL SIGNIFICANCE LEVEL		
Independent Variables	Coefficient	Significance Level
Population within ½ mile	0.015729	99.9%
Unreserved Parking Spaces	-0.058559	94.4%
Non-Blackout Percentage of Daily Trains	74.463000	84.6%
Self-Service Bike Station Spaces	1.81319	99.8%
Attended Bike Station Spaces	1.91460	99.9%
Bike Rack Spaces	1.19245	99.2%
Locker Spaces (keyed & eLocker)	1.33364	69.5%
Source: Fehr & Peers, 2012.		

Park and Ride Share

TABLE A-2 PERCENTAGE OF TOTAL BICYCLE ACCESS RIDERSHIP THAT IS P&R MODEL		
Independent Variables	Coefficient	Significance Level
Non-Blackout Percentage of Daily Trains	-3.138000	99.9%
Total Bicycle Parking Spaces	0.002193	80.0%
Security of Bicycle Parking	0.647000	90.7%
Lighting of Bicycle Parking	0.323000	59.1%
Station Type (1-5, Urban-Auto Dependent)	0.192000	98.4%
Source: Fehr & Peers, 2012.		

APPENDIX B

Model Data Inputs

Table B-1 contains the input variables used to create the models above.

TABLE B-1 MODEL INPUT DATA											
Station	Population within ½ mile	Unreserved Vehicle Parking	Non-blackout percentage	Self serve bike station spaces	Attended bike station spaces	Total Rack Spaces	Total Locker Spaces	Total Bike Park	Security of Bicycle Parking Rating	Lighting of Bicycle Parking Rating	Station Type
12th St Oakland	5,816	0	99%	0	0	0	8	8	0.69	1.11	1
16th St Mission	23,581	0	88%	0	0	77	0	77	0.74	1.43	1
19th St Oakland	10,907	0	73%	0	0	66	8	74	0.91	1.50	1
24th St Mission	25,174	0	89%	0	0	70	0	70	0.72	1.42	1
Ashby	9,072	440	94%	128	0	136	24	288	1.43	1.68	2
Balboa Park	9,518	0	90%	0	0	88	0	88	0.93	1.58	2
Bayfair	6,822	1,551	96%	0	0	42	16	58	0.67	0.87	3
Castro Valley	3,069	922	95%	0	0	20	0	20	0.76	1.06	5
Civic Center	22,299	0	80%	0	0	63	0	63	0.55	1.07	1
Coliseum	2,404	918	92%	0	0	63	0	63	0.17	0.75	3
Colma	4,369	785	95%	0	0	40	0	40	1.75	1.25	4
Concord	7,819	2,255	92%	0	0	119	16	135	0.44	1.07	5
Daly City	9,326	1,511	90%	0	0	49	20	69	0.75	0.81	4
Downtown Berkeley	9,664	0	97%	113	155	0	0	268	2.04	2.02	1
Dublin/Pleasanton	338	2,421	95%	0	0	78	12	90	0.84	1.14	5
El Cerrito Del Norte	4,662	2,006	97%	0	0	126	0	126	0.56	1.19	4
El Cerrito Plaza	5,189	568	97%	0	0	94	48	142	1.55	1.57	3
Embarcadero	3,398	0	77%	96	0	0	0	96	1.26	1.47	1
Fremont	3,369	1,506	97%	0	0	121	0	121	0.72	1.24	4
Fruitvale	9,355	518	92%	0	200	49	0	249	1.85	1.85	3
Glen Park	8,391	0	90%	0	0	49	0	49	1.14	1.61	2

**TABLE B-1
MODEL INPUT DATA**

Station	Population within ½ mile	Unreserved Vehicle Parking	Non-blackout percentage	Self serve bike station spaces	Attended bike station spaces	Total Rack Spaces	Total Locker Spaces	Total Bike Park	Security of Bicycle Parking Rating	Lighting of Bicycle Parking Rating	Station Type
Hayward	4,295	1,354	97%	0	0	70	0	70	0.80	0.78	3
Lafayette	1,674	1,119	80%	0	0	64	0	64	0.85	1.52	5
Lake Merritt	4,453	83	92%	0	0	21	32	53	0.88	1.23	2
MacArthur	9,040	362	88%	0	0	126	40	166	0.94	1.08	3
Millbrae	1,561	2,466	95%	0	0	40	0	40	0.89	1.27	5
Montgomery	7,605	0	72%	0	0	0	0	0	0.67	1.13	1
North Berkeley	9,115	595	97%	0	0	151	48	199	1.15	1.39	2
North Concord	3,303	1,870	93%	0	0	60	0	60	0.86	1.13	5
Orinda	550	1,022	80%	0	0	26	8	34	1.20	1.60	5
Pittsburg Bay Point	1,985	1,708	94%	0	0	24	0	24	0.67	0.93	5
Pleasant Hill	4,525	2,416	90%	0	0	224	24	248	0.97	1.12	5
Powell	16,423	0	72%	0	0	7	0	7	0.36	0.81	1
Richmond	7,468	693	97%	0	0	42	16	58	0.70	0.78	3
Rockridge	6,095	457	80%	0	0	133	32	165	0.95	1.26	3
San Bruno	1,916	733	95%	0	0	18	0	18	0.50	2.00	5
San Leandro	5,591	1,077	92%	0	0	93	32	125	1.28	1.24	3
South Hayward	4,304	1,005	97%	0	0	56	0	56	0.67	0.83	5
South San Francisco	3,653	1,247	95%	0	0	30	0	30	0.71	1.14	5
Union City	4,936	896	97%	0	0	8	20	28	0.62	1.15	4
Walnut Creek	3,677	1,733	80%	0	0	91	16	107	0.60	0.93	4
West Oakland	5,417	719	84%	0	0	91	26	117	0.33	0.77	4

APPENDIX C

Model Outputs

Table C-1 contains the outputs of the model using the data used to derive the model.

TABLE C-1 MODEL BASE OUTPUTS									
Station	Predicted total bicycle access ridership	Predicted P&R ridership	Predicted BWB ridership	Observed total bicycle access ridership	Observed P&R ridership	Observed BWB ridership	Predicted – Observed total bicycle access ridership	Predicted – Observed P&R ridership	Predicted – Observed BWB ridership
12th St Oakland	176	19	157	162	61	101	14	-42	56
16th St Mission	529	98	430	644	143	501	-115	-45	-71
19th St Oakland	315	94	221	232	85	147	83	9	74
24th St Mission	546	98	448	518	227	291	28	-129	157
Ashby	613	238	374	540	203	337	73	35	37
Balboa Park	322	78	244	318	42	275	4	36	-31
Bayfair	160	27	133	130	26	104	30	1	29
Castro Valley	89	22	67	84	15	69	5	7	-2
Civic Center	485	91	394	580	107	472	-95	-16	-78
Coliseum	128	18	110	145	14	130	-17	4	-20
Colma	141	50	91	22	11	11	119	39	80
Concord	223	60	163	226	58	168	-3	2	-5
Daly City	211	50	160	70	21	49	141	29	111
Downtown Berkeley	726	311	415	585	272	313	141	39	102
Dublin/Pleasanton	43	12	31	178	43	135	-135	-31	-104
El Cerrito Del Norte	178	40	139	240	71	168	-62	-31	-29
El Cerrito Plaza	297	102	195	285	150	135	12	-48	60
Embarcadero	285	93	192	548	74	473	-263	19	-281
Fremont	182	44	138	118	33	85	64	11	53
Fruitvale	627	318	309	736	286	450	-109	32	-141
Glen Park	257	66	192	164	55	109	93	11	83
Hayward	144	25	119	123	31	92	21	-6	27

**TABLE C-1
MODEL BASE OUTPUTS**

Station	Predicted total bicycle access ridership	Predicted P&R ridership	Predicted BWB ridership	Observed total bicycle access ridership	Observed P&R ridership	Observed BWB ridership	Predicted – Observed total bicycle access ridership	Predicted – Observed P&R ridership	Predicted – Observed BWB ridership
Lafayette	96	40	57	80	38	42	16	2	15
Lake Merritt	201	39	162	346	61	285	-145	-22	-123
MacArthur	390	116	274	560	150	410	-170	-34	-136
Millbrae	0	0	0	55	18	36	-55	-18	-36
Montgomery	173	38	135	280	12	268	-107	26	-133
North Berkeley	425	112	313	339	158	181	86	-46	132
North Concord	83	24	60	22	7	15	61	17	45
Orinda	50	23	27	62	29	33	-12	-6	-6
Pittsburg Bay Point	30	7	23	43	14	28	-13	-7	-5
Pleasant Hill	296	123	173	335	122	212	-39	1	-39
Powell	320	56	265	242	48	194	78	8	71
Richmond	220	36	185	143	12	131	77	24	54
Rockridge	330	121	209	242	64	178	88	57	31
San Bruno	79	21	58	74	16	58	5	5	0
San Leandro	247	76	171	249	31	218	-2	45	-47
South Hayward	148	32	116	156	13	143	-8	19	-27
South San Francisco	91	22	69	32	12	20	59	10	49
Union City	134	25	108	83	10	73	51	15	35
Walnut Creek	146	45	101	153	71	82	-7	-26	19
West Oakland	249	59	190	290	75	215	-41	-16	-25

J | Potential Funding Sources

	County Transportation Authorities (1)				Regional				State	Federal		
Project Type	San Francisco (2)	Alameda	Contra Costa (3)	San Mateo	TDA Article 3 (4)	TFCA (5)	SR2T / Measure 2 (6)	Station Area Planning Grant (7)	Bicycle Transportation Account	Future Federal Stimulus or Transportation Enhancements	SRTS (8)	STP and CMAQ (9)
Secure bicycle parking at transit	X	X		X	X	X	X	X	X	X	X	X
Construction / Engineering capital project e.g. roadway widening, bike lanes and multi-use paths, shoulder paving, restriping, bike bridge.	X	X	X	X	X	X	X		X	X	X	X
Hazard elimination or improvement e.g., substandard grates or culverts	X	X		X	X		X		X			
Maintenance of non-motorized bikeways	X	X	X		X				X			
Facilitation of bicycle-transit trips	X	X	X	X	X	X		X	X	X	X	
Traffic control devices to improve bicycle travel	X	X					X		X	X		
Adjustment of traffic-actuated signals to be bike-sensitive	X				X	X	X		X	X		
Development or update of a Bicycle Master Plan or bicycle access plan element			X		X (10)							
Bicycle Promotion Program	X	X		X		X						X
Bicycle Safety Education Program	X	X			X (11)						X	

- (1) All county funding includes Regional Lifeline funds (for projects addressing transportation gaps and transportation choice for low-income populations identified in CBTPs or collaborative planning process)
- (2) San Francisco funding includes Proposition K and Proposition AA funds
- (3) Contra Costa County funding includes Measure J funds
- (4) Transportation Development Act, Article 3 (Bicycle and Pedestrian programs)
- (5) Transportation Fund for Clean Air, administered by Bay Area Air Quality Management District
- (6) Safe Routes to Transit, funded by regional Measure 2 and administered by Metropolitan Transportation Commission, TransForm and East Bay Bicycle Coalition
- (7) Bicycle access must be part of a city-sponsored station area land use plan in a Priority Development Area (PDA)
- (8) Safe Routes to Schools grants. SRTS funding must increase bicycle and pedestrian access within 2 miles of a school; administered by different agencies in each county
- (9) Surface Transportation Program and Congestion Mitigation & Air Quality Improvement Program, will be replaced by OneBayArea program in 2012 - www.mtc.ca.gov/funding/onebayarea
- (10) Limited to once every five years
- (11) Up to 5% of county's TDA Article 3 funds, 50% match required where county policy supports use of funds for this purpose

Links to funding sources online

County Transportation Authority Funds

- San Francisco: www.sfcta.org/content/section/3/8/
- Alameda: www.alamedactc.org/app_pages/view/1701
- Contra Costa: www.ccta.net/EN/main/about/measurej.html
- San Mateo: http://www.smcta.com/pedestrian_and_bicycle_program.html

Regional

- TDA Article 3: www.mtc.ca.gov/funding/STA-TDA
- TFCA: <http://www.baaqmd.gov/Divisions/Strategic-Incentives/Funding-Sources/TFCA.aspx>
- SR2T / Measure 2: www.transformca.org/campaign/sr2t
- Station Area Planning Grant: http://www.mtc.ca.gov/planning/smart_growth/stations/

State

- Bicycle Transportation Account: www.dot.ca.gov/hq/LocalPrograms/bta/btawebPage.htm

Federal

- SRTS: Alameda: <http://transformca.org/sr2s>; Contra Costa: www.street-smarts.com/index.htm or <http://cchealth.org/groups/prevention/>; San Francisco: www.sfsaferoutes.org; San Mateo: www.ccag.ca.gov/pdf/plans-reports/2012/San%20Mateo%20County%20SR2S%20Program%20Guide_Final_Low%20Res.pdf
- STP and CMAQ: www.mtc.ca.gov/funding/STPCMAQ

K | Public Comment Summary

The following is a fully inclusive list of all the comments the public, advocacy groups and the BART Board made on the April 2012 draft BART Bicycle Plan. The comments are organized according to the categories in which the plan is laid out, plus additional sections related to plan Implementation and Other comments that don't nicely fit into the other

categories. The first column in the table is the complete list of comments. The second column lists how the comments in each subcategory were addressed in the plan, as appropriate. The numbers in parentheses indicate the number of comments made in each comment subcategory.

Public comment by category	Response / action
1 Cyclist Circulation	
Improve vertical circulation in stations for passengers with bicycles (36) <ul style="list-style-type: none"> Allow bikes on escalators / no more dangerous than stairs Clean the elevators Add facility for vertical circulation of bikes (e.g. stairway channel, new escalator design) Luggage on escalators not fair if bikes prohibited Analyze cost of liability litigation vs. the escalator ban and vs. stair channel retrofits Embarcadero (and downtown) station stairs hard for cyclists against crowds of exiting passengers 	Addressed in Recommendations 1.3 Evaluate and install stairway channels 1.4 Revisit bicycles on escalators policy 1.5 Clean elevators regularly
Strategies should better consider populations of limited economic means and English proficiency (1)	Added discussion to Recommendations 1.1 <i>Develop and install wayfinding signage</i> , 2.5 Expand bicycle payment options, and 5.2 <i>Improve communications with customers on BART bicycle policies and facilities</i>
Reduce barriers to station circulation (4) <ul style="list-style-type: none"> Shouldn't require the folding of bikes until boarding, as opposed to in the paid area More bike gates/ADA gates at all stations Gates close to fast Standardize all bike signage (use green) 	Addressed, but not recommended, in Strategy 1.6 Install additional ADA-accessible fare gates, and addressed in Recommendation 1.1 Develop and install wayfinding signage
2 Plentiful Parking	
Provide adequate bike parking (1) <ul style="list-style-type: none"> Add bike stations wherever possible, and use inverted U's or vertical locker parking otherwise 	Addressed in Recommendation 2.1 <i>Provide adequate bicycle parking of each type</i> and in Chapter 4 <i>Modeling Future Investment</i>
Fight bike theft (25) <ul style="list-style-type: none"> Provide more secure bike parking Provide more lockers Provide more bicycle parking inside fare gates Remove abandoned bikes more frequently Collaborate with BART police 	Moved bicycle security recommendation from Persuasive Programs category (Recommendation 5.6) to Plentiful Parking (new Recommendation 2.2) Addressed in Recommendation 2.4 <i>Maintain bicycle facilities more frequently</i>

Public comment by category	Response / action
<p>Strategies should better consider populations of limited economic means and limited English proficiency (1)</p> <ul style="list-style-type: none"> • BikeLink cards should be available for cash at retail outlets • Multi-lingual information • Consider need-based discounted BikeLink cards 	<p>Added to Recommendations 2.1 <i>Provide adequate bicycle parking of each type</i> and Existing Conditions chapter discussion of current police efforts, including hang tags and 12-month bike theft data</p> <p>Added to Recommendation 2.1 <i>Provide adequate bicycle parking of each type</i> and Recommendation 2.5 <i>Allow Clipper payment for bicycle parking</i></p>
3 Beyond BART Boundaries	
<p>Prioritize bike sharing (3)</p> <ul style="list-style-type: none"> • Create incentives for bike sharing • Coordinate with local agencies 	<p>Addressed in Recommendation 3.1 <i>Evaluate and implement bicycle sharing at BART stations</i></p>
<p>Coordinate with local agencies (3)</p> <ul style="list-style-type: none"> • Acknowledge that first/last mile issues fall outside of BART's influence • Recommendation 3.1 should change regional bike sharing to "near" downtown stations not "at" them • Cheaper Muni fare when coming to BART 	<p>Addressed in Strategy 3.2 <i>Support local efforts to improve bicycle access to stations</i></p> <p>Reworded in Recommendation 3.1 <i>Evaluate and implement bicycle sharing at BART stations</i></p>
4 Bikes on BART	
<p>Expand onboard strategy (96)</p> <ul style="list-style-type: none"> • Simplify blackout periods • Not fair to prohibit bikes when luggage is allowed • Evaluate need for current bike restrictions . • Look for opportunities to relax them (e.g. certain segments of system) • Shift from "no bikes allowed" message to one of being courteous and using common sense • Give cyclists opportunity to behave responsibly through bikes onboard trials • Need policy to result from this plan • The "grease-free commute" line in the plan was pretty harsh, considering the poor opinion BART ridership has about the cleanliness of BART's upholstery • Onboard access most critical, plan acknowledges greatest needs then doesn't do enough about them • Bike parking will not do nearly as much as eliminating blackout period • Even without blackout periods, you can enforce a limit of bikes on crowded trains or 2 bikes per space • "Need for bike at other end" in rider survey should be discussed more 	<p>Re-framed Recommendation 4.2 <i>Evaluate blackout periods</i></p> <ul style="list-style-type: none"> • Propose trial & objective evaluation • Suggest at least lifting in segments such as Dublin/Pleasanton to Bay Fair <p>Added discussion of long-term evolution of bikes on BART to Existing Conditions chapter</p>

Public comment by category	Response / action
Make changes in rail operations to improve bike carriage (21) <ul style="list-style-type: none"> • Provide longer trains • Provide more frequent service • Limit the number and location of bikes onboard trains, especially during special events 	Train operations are beyond the scope of this plan
Modify rail cars to better accommodate bicycles (64) <ul style="list-style-type: none"> • Provide dedicated bike car(s) • Remove seats in existing fleet to accommodate more bikes • Provide onboard racks or other devices for storing bikes onboard • Apply decal to exterior of cars to indicate dedicated Bike Space 	<p>Addressed in Recommendation 4.1 <i>Provide space for bicycles in new BART cars</i></p> <p>Modified Recommendation 4.1 <i>Provide space for bicycles in new BART cars</i></p>
Bikes crowd the trains and platforms (5) <ul style="list-style-type: none"> • Giants games—crowded, dangerous • Bikes on crowded trains are safety hazard • Bikes during special events (e.g. GG Bridge Anniversary) pose a safety hazard on platform and stairs • Stairway channels supported 	Addressed in Existing Conditions chapter and Recommendation 1.3 <i>Evaluate and install stairway channels</i>
Encourage folding bikes (2) <ul style="list-style-type: none"> • Folding bike discount • Folding bike promotion 	Addressed in Strategy 4.3 <i>Develop a folding bicycle incentive program</i>
5 Persuasive Programs	
Provide better education about and enforcement of bike-related rules & etiquette (18) <ul style="list-style-type: none"> • Enforce existing bike-related rules • Educate passengers and staff on bike rules and etiquette 	Addressed in Recommendation 5.2 <i>Improve communications with customers</i>
Create a smartphone app for bike education and information (2)	Added to Recommendation 5.2 <i>Improve communications with customers</i>
Strategies should better consider populations of limited economic means and limited English proficiency (1)	Added to Recommendation 5.2 <i>Improve communications with customers</i>
Address automobile parking fees (3) <ul style="list-style-type: none"> • Charge more for auto parking to fund bike improvements • Don't charge more for auto parking 	Addressed in Existing Conditions chapter and Recommendation 5.4 <i>Evaluate and increase automobile parking fees</i>
6 Implementation	
Create Bike program in BART Capital Improvement Plan (1) <ul style="list-style-type: none"> • Include budget for capital improvements such as bike parking, wayfinding infrastructure, stair channels and other capital-related strategies 	Added as new Recommendation 5.3
Overall strategies to implement plan (12) <ul style="list-style-type: none"> • Why doesn't the Plan have specific implementation objectives? • Include how grants can support capital improvement • Include staff from BART police, transportation planning, marketing, and operations departments in development of implementation • Measurable objectives and deadlines 	<p>Added more discussion to:</p> <ul style="list-style-type: none"> • Executive Summary chapter • Introduction chapter • Next steps in Recommendations chapter <p>Implementation plan was not part of the scope of this plan; however, BART staff was already using the</p>

Public comment by category

Response / action

- City of San Jose wants to be on external TAC, requests coordination with future San Jose stations
- Recommendations by station typology not included
- Need implementation plan
- BART and SFMTA should coordinate: upcoming SFMTA bike parking strategy study, Balboa and Glen Park access improvements, and Better Market Street planning

plan findings, recommendations and next steps to guide ongoing bicycle improvements and activities while the plan was being finalized

7 Other Comments

Goal (1)

- 8% is too low a goal

Don't forget needs of passengers who don't bike to BART (1)

- Non-cyclists needs are being ignored, bike parking is okay if automobile drivers don't have to pay for it
- Focus on 96% of riders who don't ride
- Consider the non-cyclists' safety and comfort. Don't raise parking fees.

Editorial (1)

- Confusing to have two discussions of each strategy (in both goals and recommendations chapters)
- Too much detail on investment tool for general public readership - move to appendix